

June 3, 2011

BY ECFS

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, D.C. 20554

**Re: *Applications of AT&T Mobility Spectrum LLC and Qualcomm Incorporated
For Consent to the Assignment of Lower 700 MHz Band Licenses, WT Docket No.
11-18***
REDACTED – FOR PUBLIC INSPECTION

Dear Ms. Dortch:

Pursuant to the *Protective Order*¹ in the above-referenced proceeding and the instructions set forth in the General Information Request dated May 20, 2011 (“Request”), enclosed please find the redacted response of AT&T Inc. to that Request. An unredacted Confidential response is being filed today with the Secretary’s Office along with two copies of the redacted version. Two copies of both the unredacted Confidential and redacted versions are being hand delivered to Kathy Harris of the Wireless Telecommunications Bureau.

¹ *Applications of AT&T Mobility Spectrum LLC and Qualcomm Incorporated For Consent to the Assignment of Lower 700 MHz Band Licenses, WT Docket No. 11-18, Protective Order, DA 11-806 (rel. May 20, 2011) (“Protective Order”).*

Marlene H. Dortch
June 3, 2011
Page 2

Please contact me if you have any questions. Thank you for your assistance.

Sincerely,

/s/ William E. Cook, Jr.

William E. Cook, Jr.
Counsel for AT&T Inc.

Enclosure

cc (by email):

Kathy Harris
Kate Matraves
Jim Bird

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	WT Docket No. 11-18
Applications of)	DA 11-252
AT&T Mobility Spectrum LLC and)	
QUALCOMM Incorporated)	
)	
for Consent to the Assignment of)	File No. 0004566825
Licenses and Authorizations)	

**RESPONSE OF AT&T INC. TO
GENERAL INFORMATION REQUEST DATED MAY 20, 2011**

June 3, 2011

**PARTIAL RESPONSE OF AT&T INC. TO
GENERAL INFORMATION REQUEST DATED MAY 20, 2011**

June 3, 2011

Introduction

AT&T Inc. (on behalf of its wholly-owned subsidiary AT&T Mobility Spectrum LLC) (“AT&T”) hereby provides a partial response (the “Partial Response”) to the letter dated May 20, 2011, from Ruth Milkman, Chief of the Wireless Telecommunications Bureau, and the General Information Request attached thereto (the “Request”).

The Commission asks a number of detailed questions about AT&T’s planned use of the Qualcomm Spectrum that cannot be answered with specificity at this time, because use of the unpaired Qualcomm Spectrum on AT&T’s LTE network requires additional standards-setting by appropriate bodies and the development of compatible equipment. As a result, AT&T estimates that it will be able to deploy the Qualcomm Spectrum to expand downlink capacity by late 2014 at the earliest.

Thus, while AT&T has tried to be fully responsive to the Commission’s requests, the details relating to the Qualcomm Spectrum that the Commission seeks in certain requests do not exist at this time.

With respect to the Commission’s document requests, AT&T is still collecting the tens of thousands of pages of documents requested by the Commission. Moreover, the Request calls for AT&T to submit information that is extremely sensitive from a commercial, competitive, and financial perspective, and that AT&T would not, in the normal course of its business, reveal to the public or to its competitors. AT&T and QUALCOMM Incorporated (“Qualcomm”) will separately request the issuance of a Second Protective Order in this proceeding to provide for additional protections for highly confidential information. Also, on June 2, 2011, AT&T

requested an extension of time to file documents and highly confidential information by the latter of June 10th or five business days after the Commission releases a second protective order in this proceeding.

Accordingly, set forth in this Partial Response are AT&T's responses to the questions in the Request, but AT&T has redacted highly confidential material, and highly confidential attachments, for which AT&T has sought protection under a Second Protective Order. AT&T also has identified the responses that will be provided separately by Qualcomm in its response to the Request.

Where appropriate in this Partial Response, certain material is being submitted on a confidential basis pursuant to the Protective Order in this proceeding. The confidential, unredacted submission is marked "*CONFIDENTIAL INFORMATION - SUBJECT TO PROTECTIVE ORDER IN WT Docket NO. 11-18 BEFORE THE FEDERAL COMMUNICATIONS COMMISSION - ADDITIONAL COPYING PROHIBITED.*" A version redacting all confidential information and available to the public is being filed electronically in the Commission's Electronic Comment Filing System ("ECFS").

This Partial Response and our future production of highly confidential information and documents are subject to certain understandings with Commission Staff, including, but not limited to, the following:

- AT&T is providing today paper copies of its Partial Response and certain non-highly confidential attachments, and a CD containing Excel spreadsheets of certain non-confidential attachments in response to Request No. 2. We will provide an electronic copy of the Partial Response (including attachments) on the date we submit the responsive documents in Summation Enterprise load files, which date is the subject of AT&T's extension request.
- The Commission's request for "strategic plans, policies, analyses, reports and presentations," may be limited to plans, analyses and reports prepared for,

presented to, reviewed by, discussed by , or considered by AT&T's board of directors or AT&T's executive management, or any member thereof.

- For agreed-upon custodian files, the date range for all information and document requests cover the period from January 1, 2009.

AT&T requests the return of all confidential material at the conclusion of this proceeding.

1. REQUEST:

Provide an organization chart and personnel directory in effect since January 1, 2009, for AT&T as a whole and for each of AT&T's facilities or divisions involved in any activity relating to any relevant product or relevant service.

RESPONSE:

AT&T does not maintain organizational charts during the normal course of business. For this proceeding, AT&T created a current organization chart that identified personnel, and it submitted the chart to the Wireless Telecommunications Bureau on June 1, 2011. A copy of that chart is located at Attachment 1.

2. REQUEST:

Provide a list, in Excel or other machine readable format as of the date of this Request, organized by state (including the District of Columbia, and Puerto Rico), and then by county (or municipality in the case of Puerto Rico), of each spectrum license that can be used in the provision of mobile wireless services that AT&T: (a) holds; (b) manages; (c) contracted to acquire; (d) is in negotiations to acquire; (e) plans to transfer or assign; (f) has an interest in; (g) has a joint venture or other business arrangement; or (h) leases to or from another person or entity. For each license, identify the (a) FIPS Code; (b) county (and the District of Columbia and each municipality in the case of Puerto Rico); (c) state; (d) market name, (e) market number, (e.g. CMA, MTA, and/or BTA), (f) spectrum type, (g) spectrum block (h) amount of spectrum, (i) the wireless technology format (e.g. GSM, EDGE, UMTS, HSPA, HSPA+, LTE) deployed at present and any future plans; (j) any measures of past/present/expected spectrum utilization (k) whether AT&T: (i) holds; (iii) manages; (iv) contracted to acquire; (v) is in negotiations to acquire; (vi) plans to transfer or assign; (vii) has an interest in; (viii) has a joint venture or other business arrangement; or (ix) leases to or from another person or entity.

RESPONSE:

Attachment 2.a is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T holds. Pursuant to definition 1, we have interpreted “hold” to mean having a direct or indirect interest of 10 percent or more.

AT&T does not manage any spectrum license that can be used in the provision of mobile wireless services that is not otherwise listed in Attachment 2.a or 2.f.

Attachment 2.c is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T has contracted to acquire. AT&T does not currently have wireless technology data in the format requested for most licenses listed in Attachment 2.c. In addition, AT&T has agreed to purchase the 33.8849 percent of Cincinnati SMSA Limited Partnership that it does not already hold, and that entity’s licenses are listed in Attachment 2.a.

Attachment 2.d is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T is in negotiations to acquire. AT&T has no definitive plans to transfer or assign any spectrum license that can be used in the provision of mobile wireless services. **[Begin Highly Confidential Information]**

[End Highly Confidential Information] These licenses are listed in Attachment 2.e.

Attachment 2.f is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T has an interest in and that is not listed in the other attachments. The list of licenses in Attachment 2.a held by Puerto Rico Telephone Company was compiled from the FCC's Spectrum Dashboard. For those licenses, the wireless technology format column was deliberately left blank -- **[Begin Confidential Information]**

[End Confidential Information]. Based on publicly available information, AT&T's understanding is that Puerto Rico Telephone Company has deployed CDMA almost throughout Puerto Rico and overlaid that with GSM and, in many areas, UMTS and HSPA+.

AT&T has a joint operating agreement with the Local Exchange Carriers ("LECs") listed in Attachment 2.g. Under the agreement, the LECs are authorized retailers of AT&T wireless services, which they sell under the AT&T brand. However, the LECs own the licenses listed in Attachment 2.g and provide service in their license areas through their own facilities.

Attachment 2.h.1 is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T leases to another person or entity.

Attachment 2.h.2 is an Excel file that lists each spectrum license that can be used in the provision of mobile wireless services that AT&T leases from another person or entity.

AT&T does not, in the ordinary course of business, separately track, on a license-by-license basis, the deployment of UMTS, HSPA and HSPA+, which are related technologies. Accordingly, Attachment 2 uses "UMTS" to indicate where any of those technologies may be deployed.

WCS licenses are not suitable for mobile broadband service at this time, and AT&T is aware of no other licensees deploying a mobile broadband system in this service. WCS licenses thus are not included in response to this Request No. 2.

With respect to future plans for technology format, AT&T will be using its AWS and 700 MHz licenses to deploy its LTE network. As described in Request No. 13, AT&T also has submitted to the 3GPP standards organization a request for a specification that will permit AT&T to bond the Qualcomm Spectrum with 1900 MHz spectrum on its LTE network. AT&T's cellular and PCS licenses will continue to support GSM well into this decade and UMTS/HSPA/HSPA+ even longer.

AT&T does not, in the ordinary course of business, track spectrum utilization on a license-by-license basis. However, Attachment 2.j lists, on a cell site-by-cell site basis, identified by "USID" number, how AT&T's cellular and PCS spectrum is allocated between GSM and UMTS/HSPA/HSPA+ services from January 2009 through March 2011. Attachment 2.j.1 has data for 2009, Attachment 2.j.2 has data for 2010, and Attachment 2.j.3 has data for 2011.

3. REQUEST:

On Page 13 of the Public Interest Statement, the Applicants state that “AT&T plans to begin LTE deployment in the middle of this year over its 700 MHz and AWS spectrum, which it expects largely to complete by the end of 2013.”

- i. For all CMAs, discuss in detail (on a CMA by CMA basis) these baseline AT&T plans, capacity needs, and timeframe for deploying an LTE network, marketing any relevant services and products, and making changes to any service and pricing plans (with the corresponding pricing assumptions) (*i.e.*, absent both the Proposed Transaction and the proposed AT&T/Deutsche Telekom-T-Mobile merger). Discuss, in detail, how and to what extent the Proposed Transaction would affect these plans, capacity needs, and timeframes, separately assuming that the proposed AT&T/Deutsche Telekom-T-Mobile merger has been approved and assuming that the proposed AT&T/Deutsche Telekom-T-Mobile merger has not been approved. Provide all strategic plans, policies, analyses, reports and presentations prepared on or after January 1, 2007, discussing these issues.**

RESPONSE:

AT&T’s pre-merger plan for LTE deployment, affirmed in January 2011, was to cover approximately 80 percent of the U.S. population. With the AT&T/Deutsche Telekom-T-Mobile USA merger, AT&T will have the scale, spectrum and other resources to expand LTE deployment to approximately 97 percent of the U.S. population. In Attachment 3.i.1, AT&T has provided an Excel file “AT&T LTE Deployment” setting forth AT&T’s pre-merger planned roll-out of LTE service by each CMA and by state and county (including the District of Columbia and each municipality within Puerto Rico) as well as AT&T’s proposed LTE coverage with the T-Mobile USA merger.¹

¹ [Begin Confidential Information]

[End Confidential Information] The information presented in this chart is subject to future developments based on a range of factors such as zoning, equipment availability, capital budgeting, etc.

[Begin Confidential Information]

[End Confidential Information] But, AT&T expects such build to be completed within six years of closing.

Because the 700 MHz spectrum that would be acquired in the Proposed Transaction is unpaired and must be bonded with blocks of existing spectrum to be used for LTE service, it can be used only to augment downlink capacity in areas where AT&T already has spectrum. Although there is benefit to augmented downlink capacity, the Qualcomm Spectrum, standing alone, will not affect the footprint of AT&T's LTE deployment either with or without approval of the AT&T/Deutsche Telekom- T-Mobile USA merger. Moreover, AT&T estimates that the Qualcomm Spectrum will not be available for LTE use until late 2014 at the earliest. Absent the AT&T/T-Mobile transaction, AT&T expects to deploy LTE to approximately 80% of the U.S. population by the end of 2013 and has no current plans for any further LTE deployment.

[Begin Confidential Information]

[End Confidential Information] AT&T has provided an excel file with the Corporate Strategy group's most recent analysis in Attachment 3.i.2.

For LTE pricing, **[Begin Highly Confidential Information]**

[End Highly Confidential Information]

The current marketing plan for LTE takes a three-stage approach. **[Begin Highly Confidential Information]**

[End Highly Confidential Information].

Because, as noted above, the Qualcomm Spectrum does not affect AT&T's current planned LTE footprint, the Proposed Transaction will not affect AT&T's current marketing or pricing planning.

AT&T's planning regarding integration of T-Mobile USA is necessarily preliminary at this stage; consequently, AT&T has no specific plans regarding marketing or pricing after the completion of that acquisition and thus is unable to discuss what, if any, impact the Proposed Transaction will have on those plans.

AT&T will provide additional plans, analyses and reports responsive to this request, if any, at a later date.

Footnote continued from previous page

=wireless-networks-general|mk-att-wireless-networks; Press Release, AT&T Inc., AT&T to Roll Out 4G LTE in Houston (May 25, 2011), *available at* <http://www.att.com/gen/press-room?pid=19874&cdvn=news&newsarticleid=31955&mapcode=mk-att-wireless-networks|wireless>; Press Release, AT&T Inc., AT&T to Roll Out 4G LTE in San Antonio (May 25, 2011), *available at* <http://www.att.com/gen/press-room?pid=19877&cdvn=news&newsarticleid=31958&mapcode=wireless-networks-general|wireless>.

REQUEST:

- ii. **For all CMAs, describe in detail (on a CMA-by-CMA basis) the current and projected uplink and downlink data usage by your current and projected customer base, and the corresponding pricing assumptions, technologies and services currently used or projected to be used through 2014. Provide projections for the baseline case (*i.e.*, absent both the Proposed Transaction and the proposed AT&T/Deutsche Telekom-T -Mobile merger), as well as two separate projections showing the impact of the Proposed Transaction: (a) for circumstances as set forth in the Proposed Transaction (*i.e.*, absent any AT&T/Deutsche Telekom-T -Mobile merger), and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.**

RESPONSE:

To the extent this sub-specification requests information about all mobile wireless services, AT&T believes that it is not relevant to the proposed transaction because the proposed transaction is an acquisition of unpaired 700 MHz spectrum that only can be utilized with existing spectrum⁴ and will only be used for downlink and not uplink, and because AT&T plans to utilize the spectrum acquired from Qualcomm to pair with spectrum AT&T uses for its LTE network. It is possible that documents produced in response to Request No. 25 below contain some information responsive to this request.

As discussed above in response to specification 3.i of this request, **[Begin Confidential Information]**

[End Confidential Information] AT&T has provided an Excel file with the Corporate Strategy group's most recent analysis in Attachment 3.i.2. As discussed further below in response to

⁴ AT&T will acquire only 6 MHz of Lower 700 MHz D block spectrum nationwide. AT&T will acquire Qualcomm's Lower 700 MHz E block licenses in the New York, Los Angeles, San Francisco, Boston, and Philadelphia Economic Areas, which will give AT&T a total of 12 MHz of capacity in those areas.

Request No. 10, AT&T's data traffic has increased over 8,000 percent from 2007 to 2010. These trends are expected to continue. It has been AT&T's experience that customer usage increases as faster data speeds are deployed. However, because AT&T is in the early stages of its LTE deployment and does not currently have any LTE customers, at present, AT&T does not have information, on a CMA-by-CMA basis, regarding data usage by its current and projected LTE customer base. Similarly, AT&T does not have information regarding projected data usage by its current and projected LTE customer base taking into account the Proposed Transaction.

The T-Mobile USA acquisition will not change how AT&T plans to use the spectrum it acquires through the Proposed Transaction to supplement downlink capacity. Once all the necessary supplemental downlink specifications are established and network and customer equipment is available, AT&T plans to utilize the Qualcomm Spectrum to support its LTE deployment, regardless of whether or not the T-Mobile USA transaction is consummated. The larger LTE footprint resulting from the T-Mobile USA acquisition may allow AT&T to utilize the Qualcomm Spectrum for supplemental downlink purposes in more areas, thus benefitting more people. The Proposed Transaction, standing alone, will not expand AT&T's planned LTE coverage now, or when the Qualcomm Spectrum ultimately becomes available for use.

4. REQUEST:

For all CMAs, discuss (on a CMA-by-CMA basis) AT&T's current and projected capacity and bandwidth requirements for mobile wireless services, corresponding covered population, and corresponding pricing assumptions. Include the amount and type of spectrum required by AT&T to provide current and projected relevant services and services that would use the LTE network for AT&T's retail subscribers. Explain precisely why AT&T believes it is capacity constrained, including how and where such asserted capacity constraints affect AT&T's current and projected ability to provide mobile wireless services to its customers, with any relevant pricing assumptions. Provide current and projected information for the baseline case (*i.e.*, absent both the Proposed Transaction and the proposed AT&T/Deutsche Telekom-T-Mobile merger), as well as separate projections showing the impact of the Proposed Transaction: (a) for circumstances as set forth in the Proposed Transaction (*i.e.*, absent any AT&T/Deutsche Telekom-T-Mobile merger), and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

As the Proposed Transaction is an acquisition of unpaired 700 MHz spectrum that only can be utilized with existing spectrum, and in light of the fact that AT&T plans to utilize the spectrum acquired from Qualcomm to pair with spectrum AT&T uses for its LTE network, AT&T does not believe that questions regarding all mobile wireless services are relevant to the issues currently before the Commission on the Proposed Transaction. AT&T is in the early stages of its LTE build-out. **[Begin Confidential Information]**

[End

Confidential Information]

⁵ AT&T does not maintain in the ordinary course of business records that show the amount of spectrum required to provide mobile wireless services. Indeed, the amount of spectrum “required” to provide service depends on a number of constantly shifting factors within each

Footnote continued on next page

As discussed above, however, AT&T's Corporate Strategy group **[Begin Confidential Information]**

[End Confidential Information] As described above, that information is provided in Attachment 3.i.2.

The T-Mobile USA acquisition will not change the purposes for which AT&T plans to use the spectrum it will acquire through the Proposed Transaction. After the T-Mobile USA acquisition is complete, AT&T may utilize the Qualcomm Spectrum to expand downlink capacity for LTE services on the spectrum acquired from T-Mobile USA, but the spectrum from the Proposed Transaction, standing alone, will not expand AT&T's footprint now, or when the Qualcomm Spectrum becomes available for use.

5. REQUEST:

Explain (a) types of mobile wireless services and applications that would benefit from use of a supplemental downlink; (b) how the use of supplemental downlink technology can provide efficiencies in the provision of those mobile wireless services; and (c) any projected efficiencies that a supplemental downlink technology, when combined with technology on paired spectrum, can bring in the provision of mobile wireless services. Provide all strategic plans, policies, analyses, reports and presentations discussing these issues.

RESPONSE:

Supplemental downlink technology will be used to bond the Lower D and E block spectrum with AT&T's paired spectrum. The resulting additional downlink capacity will help

Footnote continued from previous page
market, including changes in actual and anticipated demand, subscriber profiles, the geographic landscape, the number and height of buildings, technological advancements, and desired service quality, among many others. Because AT&T is in the early stages of its LTE build-out, it would be difficult in any event to quantify on a CMA-by-CMA basis the amount and type of spectrum "required" for LTE service. **[Begin Confidential Information]**

[End Confidential Information]

address the asymmetry of data flow that results from wireless broadband users currently consuming more downlink than uplink capacity. Although this ratio is expected to change over time, the additional capacity (when available) would help relieve downlink congestion for LTE services. However, such technology and the unpaired spectrum that is the subject of this transaction will not solve AT&T's total spectrum and capacity needs.

There also will be an improvement in a customer's experience with LTE service and applications. For example, customers who use iPads and other tablets which will support this capability or devices with large screens will notice improvements in speed and performance of high-resolution applications and download, and also may experience a more seamless video or gaming experience. Customers will experience faster, more consistent, and more reliable LTE download services, particularly during periods of peak use – thus permitting the downloading of videos, files, and other services in as little as half the time. (Actual customer experience will depend on a number of factors, including system peak throughput and capacity, where a user is located, number of users in the area, backhaul capacities, traffic characteristics of users, customer device type and capabilities, local interference, mobility speed, and various factors related to network build and terrain.)

A discussion of the efficiency gains from supplemental downlink requested in 5(b)-(c) is set forth in the response to Request No. 6.

AT&T will provide plans, analyses and reports responsive to this request, if any, at a later date.

6. REQUEST

On page 17 of the Public Interest Statement, the Applicants state that “the Qualcomm Spectrum substantially will boost the capacity that otherwise would have been available.” Quantify how the acquisition of the spectrum assets will substantially boost capacity, including the number of customers affected, speed of uplink and downlink, and service quality: (a) for circumstances as set forth in the Proposed Transaction (i.e., absent any AT&T/Deutsche Telekom-T-Mobile merger), and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

The general characteristics and effects of the use of the supplemental downlink technology that the Applicants propose are clear. Because data downlink traffic far exceeds data uplink traffic in today’s subscriber usage profile on mobile networks at this time, a major constraint on spectrum utility and capacity arises from the limitations on downlink capacity and the demands placed on the half of the paired spectrum used for downlinks. That is precisely the constraint that asymmetrical carrier aggregation (*i.e.*, supplemental downlink) addresses, and it does so by increasing the available downlink spectrum in a particular affected service area, with increased bandwidth producing increases in capacity over that available in the absence of the use of this carrier aggregation technique. The increased downlink spectrum permits efficiencies gains. In particular, the broader block of spectrum permits more efficient handling of bursty traffic. This effectively increases the utilization efficiency and capacity of both the initial downlink spectrum and the supplemental downlink spectrum. There are limits, however, on the ability to quantify in detail the particular operational characteristics of this type of carrier aggregation and how the supplemental downlink will function in particular operational settings. For LTE Advanced, carriers that intend to use the technology are still engaged in standards-setting and decision-making processes related to the particular operational characteristics of aspects of the supplemental downlink technology, particularly as used in the particular

configuration suitable for Applicants. Moreover, the additional capacity using spectrum bonding technology will not solve a carrier's spectrum constraints if consumer demand for services and applications exceeds the capacity of the additional spectrum. And, carriers may need additional paired spectrum with uplink capability to address the expected increase in uplink traffic in the future.

Tests and simulations of the supplemental downlink technology do, however, provide a sound basis to address the quantification of the boost in capacity that the technology can be anticipated to achieve. As to speed of downlink and related capacity increases, materials prepared by Qualcomm provide quantifications under the particular simulation assumptions chosen of increases in burst data rates.⁶ Qualcomm's materials also address the number of customers that will be affected by the use of supplemental downlink technology.⁷

The overall real-world gains are dependent on the amount of spectrum in the original downlink, the amount of spectrum in the supplemental downlink, the specific nature of the application traffic, and the scheduling algorithms in the LTE network equipment. AT&T will be highly motivated to create the best possible combinations and highest possible efficiencies in all regions based on the overall available spectrum. This quantification applies for both the scenario that anticipates a merger between AT&T- T-Mobile USA and the scenario which does not.

Finally, service quality would increase as a result of the use of supplemental downlink technology. Customers will experience a reduction in latency as the system becomes more

⁶ See Qualcomm, Supplemental Downlink Demo for FCC, May 11, 2011 ("SDL Demo") (Attachment 6-1); LTE Carrier Aggregation Performance for AT&T, Oct. 3, 2010 ("LTE CA") (Attachment 6-2).

⁷ See SDL Demo, at 3.

loaded and delay increases.⁸ This positive effect on customer service would generally be independent of the AT&T– T-Mobile USA merger.

Again, the indications of quantifications set out above are based on particular scenarios and technical assumptions. The increases in performance will vary depending on the relationship between the size of the channels used for downlink and uplink compared to the size of the channel used for supplemental downlink.

In short, the supplemental downlink technology will permit AT&T to increase the downlink capacity on the LTE network by bonding the underutilized Qualcomm Spectrum. As a result, AT&T will be able to support more customers than it could have otherwise with some improvements in a customer's mobile wireless experience. But such technology and the unpaired spectrum that AT&T will acquire will not solve AT&T's total capacity and spectrum needs.

7. REQUEST:

Provide all strategic plans, policies, analyses, reports and presentations, from January 1, 2007 to the present, discussing possible constraints in capacity or in increasing capacity to serve current and potential future customers, including:

- i. Acquisition of new spectrum;**
- ii. Plans to increase network capacity using existing spectrum;**
- iii. Alternative solutions to spectrum constraint problems;**
- iv. Repurposing spectrum; and**
- v. Constraints other than spectrum (e.g., backhaul).**

⁸ See LTE CA, at 7.

RESPONSE:

AT&T will provide strategic plans, analyses and reports responsive to this request, if any, at a later date.

8. REQUEST:

On page 14 of the Public Interest Statement, the Applicants state that the Qualcomm spectrum would enable AT&T to add "substantial capacity on its LTE network," and "provide a more robust and competitive service." Explain in detail and provide all documents that discuss why the expanded capacity made possible by the supplemental downlink technology would be needed for AT&T to provide a more robust and competitive service. The information in response to this question should be provided separately for the following circumstances: (a) for circumstances as set forth in the Proposed Transaction (*i.e.*, absent any AT&T/Deutsche Telekom-T-Mobile merger), and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

a. The Proposed Transaction will enable AT&T to expand capacity to provide services over the LTE network by late 2014 at the earliest. As discussed in the Public Interest Statement,⁹ AT&T faces significant capacity constraints due to consumers' exploding demand for wireless broadband services. In order to stay competitive, AT&T must expand capacity to address this demand. Consumers' demand for wireless broadband services is currently asymmetrical, because users most often require more downlink than uplink capacity for the consumption of video and other data-heavy media content.¹⁰ The Proposed Transaction helps AT&T to address the asymmetry by expanding AT&T's LTE downlink capacity. However, the unpaired spectrum that is the subject of this transaction will not solve AT&T's total spectrum and capacity needs.

⁹ *In the Matter of Applications of AT&T Mobility Spectrum LLC and Qualcomm Incorporated for Consent to the Assignment of Licenses and Authorizations*, WT Dkt No. 11-18, Public Interest Statement, at 14 (Jan. 13, 2011) ("Public Interest Statement").

¹⁰ *Id.* at 14-15.

In light of the asymmetrical consumer demand for wireless broadband services, AT&T will bond existing spectrum with the Qualcomm Spectrum to expand its LTE downlink capacity.

As discussed in the declaration of Kristin Rinne:

Supplemental downlink technology will allow AT&T to use Qualcomm's unpaired 700 MHz spectrum in conjunction with AT&T's paired spectrum, thereby permitting substantial capacity gains. The technology facilitates the bonding of non-contiguous spectrum onto a single wider channel, which permits carriers to address the asymmetry of data flows between downlink and uplink channels. That asymmetry exists because wireless broadband users most often require far more downlink than uplink capacity. Such asymmetric flow results, for example, from the consumption of video and other data-heavy media content with mostly one-sided data flows.¹¹

The proposed transaction will help AT&T to handle the increasing demands of consumers downloading large amounts of data and utilizing data-intensive applications and services on its LTE network.¹² However, while helping to alleviate the demands that will be placed on AT&T's network, the technology will not resolve AT&T's current and growing need for additional capacity and spectrum.

b. As noted above, AT&T's acquisition of T-Mobile USA will not change the purposes for which the Qualcomm Spectrum will be used. AT&T does anticipate, however, that it may be able to pair the Qualcomm 700 MHz spectrum it will acquire through the Proposed Transaction with spectrum it acquires through the acquisition of T-Mobile USA. Thus, the Proposed Transaction will add capacity and enhance network performance in areas where AT&T already has spectrum, including spectrum that it may acquire from T-Mobile USA. As discussed above

¹¹ *In the Matter of Applications of AT&T Mobility Spectrum LLC and Qualcomm Incorporated for Consent to the Assignment of Licenses and Authorizations*, WT Dkt No. 11-18, Declaration of Kristin S. Rinne, ¶ 6 (Jan. 13, 2011) ("Rinne Decl.").

¹² Public Interest Statement at 17.

in response to specification 3(ii), the larger LTE footprint resulting from the T-Mobile USA acquisition may enable AT&T to deploy a more robust LTE product in more areas. The two transactions are not substitutes, but are complementary. While the two transactions are distinctly different and serve different purposes, the Qualcomm Spectrum can be used in the future to expand downlink capacity on spectrum that AT&T currently has or that AT&T acquires from T-Mobile USA. However, the acquisition of the Qualcomm Spectrum will not resolve AT&T's current or future capacity needs. AT&T will be gaining only 6 MHz of unpaired spectrum in most of the country, and even where it obtains 12 MHz, the spectrum will be unpaired and limited for downlink capacity.

AT&T will provide documents responsive to this request, if any, at a later date.

9. REQUEST

On pages 6-7 of the Rinne Declaration, it states that “[t]he addition of the Qualcomm Spectrum to the LTE network will result in trunking efficiency gains and higher downlink peak speeds, a significant increase in throughput, and lower latencies in the network.” Provide all strategic plans, policies, analyses, reports, and presentations, including any feasibility studies, that discuss trunking as well as other efficiency gains, higher downlink peak speeds, increased throughput, and lower latencies that may result from this supplemental downlink capacity for different user applications. Provide as well detailed estimates of the magnitude of increases in all efficiencies, including spectrum efficiency, that may result from the use of Qualcomm’s spectrum to provide AT&T with supplemental downlink capacity.

RESPONSE:

The term “trunking efficiency gains” is intended to capture the various efficiencies that will be realized as a result of the increased performance on downlink channels, including increases in downlink peak speeds, lower latency, and increased user throughput. An estimate of the magnitude of these efficiencies is set forth in the response to Request No. 6.

AT&T will provide plans, analyses and reports responsive to this request, if any, at a later date.

10. REQUEST:

On page 15 of the Public Interest Statement, the Applicants state that “AT&T and likely other carriers will make significant use of supplemental downlink technology as they strive to meet consumers’ seemingly ever-growing appetite for wireless broadband services.” In support of this assertion, on pages 2-3 of her Declaration, Dr. Rinne notes an expectation that AT&T and other providers in the United States and around the world, will turn to supplemental downlink “as they attempt to efficiently manage their spectrum to help meet consumers’ increasing demand for wireless broadband services.” Explain in detail the basis for these statements. Identify the other U.S. providers and define “wireless broadband services” as used by Ms. Rinne in this context. Provide all documents discussing this issue, including documents that discuss Ms. Rinne’s expectation that other providers in the U.S. and around the world will use supplemental downlink technology.

RESPONSE:

“Wireless broadband services” is used in the Declaration to refer generally to services provided through wireless mobile communications devices over wireless technologies.

The basis for the Declaration’s statements concerning carriers’ “attempt[s] to efficiently manage their spectrum to meet increasing demands for wireless broadband services” are reflected in the Commission’s and individual Commissioners’ own statements regarding increasing demands placed on spectrum and the resulting need for carriers to address spectrum exhaustion and capacity limitations.¹³ Data traffic on AT&T’s mobile network, driven in part by iPhone usage, is up 8,000 percent over the past four years, and by 2015, it is expected to be eight

¹³ See, e.g., See FCC, Connecting America: The National Broadband Plan, Ch. 5 (2010) (“NBP”), available at <http://www.broadband.gov/download-plan/>; Julius Genachowski, Chairman, FCC, Remarks at NAB Show 2010 (April 13, 2010), available at <http://hraunfoss.fcc.gov/edocspublic/attachmatch/DOC-297469A1.pdf>; Julius Genachowski, Chairman, FCC, Prepared Remarks at the 2011 International Consumers Electronics Show (Jan. 7, 2011), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-303984A1.pdf.

to 10 times what it was in 2010.¹⁴ Verizon Wireless says it, too, has recently experienced substantial data growth in its network. According to Cisco, North American wireless networks carried approximately 17 petabytes per month in 2009. “By 2014, Cisco predicts wireless networks in North America will carry some 740 petabytes per month, a greater than 40-fold increase. Other industry analysts forecast large proportional increases.”¹⁵ The National Broadband Plan indicates that these trends will be reinforced by “increased adoption of Internet-connected mobile computing devices and increased data consumption per device,” as well as “a huge increase in machine-based wireless broadband communications” and “[t]he rollout of advanced 4G networks” that will “increase the range of applications and devices that can benefit from mobile broadband connectivity”¹⁶ Paralleling the Declaration, the Plan indicated that “[i]n the absence of sufficient spectrum, network providers must turn to costly alternatives”¹⁷ The same need to manage spectrum constraint by carriers underlays the Plan’s recommendations for repositioning spectrum or making additional spectrum available to support wireless mobile broadband networks and services.

Carrier participation in the standards-setting process provides the basis for concluding that it is “likely” that other carriers will turn to supplemental downlink technology and which U.S. and global carriers those are likely to be. Our response to Request No. 13 provides an overview of the 3GPP specification process and the related RAN meetings that address this technology and carrier aggregation. A wide variety of operators and vendors participate in this

¹⁴ Press Release, AT&T, AT&T To Acquire T-Mobile USA From Deutsche Telekom, (March 20, 2011) <http://www.att.com/gen/press-room?pid=19358&cdvn=news&newsarticleid=31703&mapcode=corporate|financial>.

¹⁵ NBP at 76-77.

¹⁶ NBP at 77.

¹⁷ *Id.*

process and are developing scenarios and progressing work items related to their interest in, and likely plans for, use of the carrier aggregation technology. Details on carrier activities related to carrier aggregation in the context of the 3GPP process is set forth in the chart accompanying the response to Request No. 13.

In addition, other sources indicate the breadth of wireless carrier focus on carrier aggregation (also known as “spectrum aggregation”). As one recent study indicated, “[a]s one of the key technologies of LTE-Advanced, spectrum aggregation is attracting increasing attention from Ericsson, NTT Docomo, ETRI, China Mobile, and so on.”¹⁸ There are other indications of the extensive work undertaken by NTT DoCoMo.¹⁹ Nokia Siemens and Agilent have also demonstrated their commitment to developing equipment based upon carrier aggregation technologies.²⁰

AT&T will provide documents responsive to this request, if any, at a later date.

¹⁸ Wei Wang, Zhaoyang Zhang & Aiping Huang, Macrothink Institute, *Spectrum Aggregation: Overview and Challenges*, at 2, Network Protocols and Algorithms, Vol. 2, No. 1 (2010), available at <http://www.macrothink.org/journal/index.php/npa/article/viewFile/329/275>.

¹⁹ See NTT DoCoMo, Carrier Aggregation Deployment Scenarios, Discussion Paper for 3GPP TSG-RAN WG2 #68 (Valencia, Spain, Jan. 18-22, 2010); James Middleton, *DoCoMo Eyes Up Blazing Speeds on LTE Advanced Trials*, Telecoms.com (Feb. 7, 2011), available at <http://www.telecoms.com/24433/docomo-eyes-up-blazing-speeds-on-lte-advanced-trials/>; see also NTT DoCoMo, LTE-Advanced Key Technologies Implemented in DOCOMO’s Experimental Equipment, available at www.nttdocomo.com/pr/files/20110207_Attachment01.pdf (showing NTT DoCoMo carrier aggregation trial).

²⁰ See Press Release, Nokia Siemens Networks, LTE-Advanced “Carrier Aggregation” on Commercial Equipment a World First (Feb. 9, 2011), available at <http://www.nokiasiemensnetworks.com/news-events/press-room/press-releases/lte-advanced-carrier-aggregation-on-commercial-equipment-a-wor>; Press Release, Agilent Technologies, *Agilent Technologies Introduces Industry’s First LTE-Advanced Signal Generation, Analysis Solutions*, <http://www.agilent.com/about/newsroom/presrel/2011/02feb-em11015.html>.

11. REQUEST:

Page 4 of the Rinne Declaration states, “The Qualcomm Spectrum will enable AT&T to expand capacity on its LTE network nationwide. AT&T will acquire the Lower 700 MHz D and E Blocks in major metropolitan areas – New York, Boston, Philadelphia, Los Angeles and San Francisco AT&T will be able to expand the LTE downlink capacity in such areas by as much as an additional 10 MHz, with the remaining 2 MHz available as guard band.” On page 5, the Rinne Declaration further states, “[i]n areas where Qualcomm holds only Lower 700 MHz D Block spectrum, AT&T will use up to 5 MHz of the spectrum to expand its LTE downlink capacity, with the remaining 1 MHz available as a guard band.” Explain these statements in detail and provide all documents discussing this issue.

RESPONSE:

The Lower 700 MHz D and E blocks each contain 6 MHz of spectrum. In areas where AT&T will acquire both the Lower 700 MHz D and E blocks, AT&T will have 12 MHz of D/E block spectrum. This will permit AT&T to create a nominal 10 MHz channel for LTE downlink where it holds both the Lower D and E block, and a nominal 5 MHz channel where it holds only the D block. AT&T has not yet decided on the size of the guard band it will deploy. **[Begin Highly Confidential]**

[End

Highly Confidential].

AT&T will provide documents responsive to this request, if any, at a later date.

As part of the response, address the following:

- i. **How AT&T plans to mitigate base station-to-base station interference from downlink Lower 700 MHz D or D and E Block transmissions to its own uplink transmissions in the Lower 700 MHz B and/or C Blocks. Address separately situations in which AT&T would hold only the D Block license and situations in which AT&T would hold both D and E Block licenses. Describe the following:**
 - a. **The extent to which AT&T's B and C Block base stations and D and E Block base stations will be operating on different towers/buildings in the same geographic area or co-located at the same towers/buildings.**
 - b. **For i.a above, calculations of the amount of isolation (in decibels - dB) required between base stations or other network equipment transmitting on the D or D and E Blocks and AT&T base stations or other network equipment receiving on the B and/or C Blocks. These calculations should include analyses of interference from out-of-band emissions, in-band blocking, and intermodulation, as well as a determination of the dominant interference mechanism, along with any other relevant data.**
 - c. **Deployment practices that will achieve the required isolation, including required vertical, horizontal, and angular separation of antennas and other network equipment, filter performance on the B and C Blocks receive channels (at the base stations and other network equipment), level of reduction of out-of-band emissions from transmissions in the Lower 700 MHz D or D and E Blocks, and any other factors that may contribute to the required isolation.**
 - d. **Any associated performance degradation, limitations, affects on capacity and/or additional costs related to the above solutions.**

RESPONSE:

AT&T is continuing to explore options to mitigate potential base station-to-base station interference, but it has not yet developed a plan to address such interference in situations where AT&T would hold the D block license or the D and E block licenses. Such plan will depend on the supplemental downlink specifications that are established for the bonding of the Qualcomm Spectrum with AT&T's spectrum. In the response to Request No. 13, AT&T notes that the supplemental downlink standard that will permit it to bond the D and E blocks with its 1900

MHz spectrum will not be released until December 2012, and specifications for AWS and 850 MHz will follow that. Also, the actual base station equipment that will accommodate these spectrum bands is yet to be developed. AT&T has initiated discussions with vendors regarding potential D and E block base station designs, but AT&T has not yet designed its D and D/E block base stations.

AT&T notes that the solution to potential interference from D and/or E block transmissions will not be a simple matter of locating base stations on different buildings or towers. In some cases, it may be better to have two base stations co-located on the same tower if they are sufficiently separated than having them on separate buildings, *e.g.*, when D and/or E block antennas are pointing towards a B and/or C block base station across the street. Thus, the solution may vary, depending on the circumstances.

Because the D and E block standards and equipment are not yet in place, AT&T has not yet calculated the amount of isolation required between base stations on the D and D/E blocks and base stations on the B and/or C blocks, or established deployment practices. Similarly, AT&T has not yet conducted site planning to determine the extent to which AT&T's B and C block stations and D and E block stations will operate on different or the same towers or buildings. Because AT&T does not yet have plans to address the potential interference between base stations, it cannot calculate any performance degradation, limitations, effects on capacity, or other costs, if any, that will be attributable to its plans.

- ii. **How AT&T's deployment of Lower 700 MHz D Block or D and E Block base stations will affect base station deployments by other licensees in the Lower 700 MHz A, B, and C Blocks. Describe the following:**
- a. **The extent to which deployments by other licensees in the A, B, or C Blocks will need to be co-located on the same towers/buildings with, or on locations in the vicinity of, AT&T's Lower 700 MHz D or D and E Block base stations. Include descriptions of (1) how AT&T's deployment in the D or D and E Blocks will affect future deployments in the A, B, or C Blocks by other licensees, and (2) how existing deployments by other licensees will affect AT&T's deployment in the D or D and E Blocks. Describe in detail how AT&T will coordinate its D or E Block base station deployment with other Lower 700 MHz licensees in both of these cases, and describe any assumptions that AT&T is making about the technology, topology, or other characteristics of these deployments.**
 - b. **Any differences between the required base station isolation, or methodology to achieve it, as described in i.b and i.c above when considering interference to other Lower 700 MHz licensees.**
 - c. **Any associated performance degradation, limitations, affects on capacity, and/or additional costs related to the above solutions.**

RESPONSE:

As noted above in response to Request No. 11.i, AT&T is continuing to explore options to mitigate base station-to-base station interference, but has not yet developed a plan to address such interference in situations where AT&T would hold the D block license or the D and E block licenses. Thus, AT&T is not yet able to: (a) identify the extent to which deployments by other licensees in the A, B, or C blocks will need to be co-located on the same towers/buildings with, or on locations in the vicinity of, AT&T's Lower 700 MHz D or D and E Block base stations, (b) describe the differences, if any, between the required base station isolation described in Request No. 11.i when considering interference to other Lower 700 MHz licensees, or (c) describe any associated performance degradation, limitations, effects on capacity, and/or additional costs, if any, related to AT&T's plans.

AT&T's deployment of D and E block base stations should have little effect on future deployments of A, B, and C block base stations by AT&T or any other licensee. AT&T holds licenses for Lower 700 MHz B and C blocks, and, thus, has every incentive to mitigate interference from its D and E block base stations to other Lower 700 MHz base stations. AT&T expects that future deployments by A, B, and C licensees will use receiver input filtering similar to what AT&T will use for its Lower B or C block deployments, as a matter of good engineering practice.

AT&T also does not anticipate that its deployment of the D and D/E block base stations will impact existing deployments by other licensees. These licensees presumably already have designed their systems to address the interference from FLO-TV's higher-powered operations. As noted in Paragraph 18 of the Rinne Declaration, AT&T's base stations will operate at power levels much lower than those permitted under the Commission's rules for broadcast-type services. This substantial reduction in transmission power will mitigate interference with other Lower 700 MHz blocks.

In the event there are interference issues with other 700 MHz licensees, AT&T has not developed plans for how it will coordinate its D or E block base station deployment with current 700 MHz licensees or with future deployments by such licensees. However, AT&T will do so in accordance with FCC regulations,²¹ and may consider the options for voluntary coordination set forth by the Commission²² and standard wireless industry practices for interference coordination.

²¹ See 47 C.F.R. § 27.64.

²² *In re Reallocation & Serv. Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, Report and Order, 17 FCC Rcd. 1022, 1065-66 ¶¶ 106, 110 and App. D ¶ 3 (2002) (declining to impose mandatory coordination on Lower 700 MHz licensees, but encouraging licensees to coordinate voluntarily and use means such as selective vertical antenna patterns, tilting antennas, improved filtering, and avoiding the use of spectrum at the edge of their authorized blocks).

- iii. **How AT&T plans to mitigate and/or otherwise address the possibility of mobile-to-mobile interference to user devices utilizing the Lower 700 MHz D or D and E Block transmissions on the Lower 700 MHz A, B, and C Blocks Describe the following:**
- a. **The minimum required isolation (in dBs) and corresponding separation distance between mobile devices receiving on the Lower 700 MHz D or D and E Block and those transmitting on the A, B, or C Blocks to ensure interference-free reception of supplemental downlink transmissions.**
 - b. **Any differences between how AT&T might mitigate the effects of interference caused by their own Band 17 devices versus that caused by Band 12 or Band 17 devices developed and deployed by other Lower 700 MHz licensees.**
 - c. **Any effects on cost and any possible limitations (*e.g.*, capacity, performance, commercial availability, etc.) on Lower 70 MHz user devices, including those operating in the Lower 700 MHz D or D and E Blocks, as well as those operating in Band 12 or Band 17.**

RESPONSE:

The minimum isolation and separation distance that will be required in devices is an issue that handset manufacturers will address. While AT&T consults with handset manufacturers, AT&T will not manufacture the equipment. It is AT&T's understanding that the design specifications for devices incorporating the Lower D and E blocks have not yet been established by manufacturers. In Paragraph 8 of her Declaration, Ms. Rinne stated that she did not expect such equipment to be ready for consumers until late 2014, at the earliest. Thus, at this time, AT&T does not know the minimum isolation and corresponding separation distance that is required for mobile devices receiving on the Lower 700 MHz D or D and E block and those transmitting on the A, B or C blocks.

AT&T does not expect that the inclusion of the Lower D and E blocks into its mobile devices will *cause* any additional mobile-to-mobile interference for the simple reason that those blocks will be used only for downlink. Further, as Ms. Rinne noted in her Declaration, AT&T

has no plans to bond the D and E blocks with the B and C blocks using supplemental downlink because such combination would create an unacceptable level of self-interference within a device if those spectrum bands are used simultaneously. **[Begin Confidential]**

[End Confidential]

As noted above, mobile devices incorporating the Lower D and E blocks have not been designed and developed. Thus, AT&T cannot now state with any certainty any effects of mobile-to-mobile interference on costs, or possible limitations on Lower 700 MHz devices. AT&T notes as a general matter that the incorporation of the D and E blocks into its devices will require modifications to a mobile device, including, for example, the installation of a filter, but it is premature to determine the cost of such device modifications until such devices are designed and ready to manufacture. Similarly, other carriers' Band 12 and Band 17 devices may interfere with the D and E blocks. It is possible the interference may impact performance, such as the speed of a customer's connection, but the extent of such an impact is mere speculation at this point since devices incorporating the D and E blocks have not yet been designed and tested.

AT&T will provide documents responsive to this request, if any, at a later date.

12. REQUEST:

Explain and provide all documents discussing the effect of the Proposed Transaction on interoperability of devices within the 700 MHz band and across other bands, including AWS, cellular, PCS, and Lower 700 MHz B and C Block spectrum. What combinations of spectrum bands do the Applicants anticipate being included in the design of mobile devices going forward, in light of or absent the Proposed Transaction?

RESPONSE:

AT&T's LTE service will use Lower 700 MHz B and C Block (Band 17) and AWS spectrum. In addition to adding Band 17 and AWS, AT&T will also add the Lower 700 MHz D and E Blocks to its devices after closing this transaction and once standards have been adopted and equipment and devices have been developed. AT&T's mobile devices will also interoperate on the following bands and technologies: 850 MHz cellular and 1900 MHz PCS bands domestically and the 900 and 1800 MHz GSM/EDGE bands and the 2100 MHz UMTS band for global roaming.

AT&T has no plans to use other bands, including the Upper 700 MHz band and the Lower 700 MHz A block. From time to time, AT&T will investigate bands used in other countries for international roaming purposes, but AT&T has no current plans to use any such bands. This transaction has no effect on those plans.

AT&T will provide documents responsive to this request, if any, at a later date.

13. REQUEST:

On page i of the Public Interest Statement, the Applicants state that AT&T “plans to promptly bond the Qualcomm Spectrum with paired spectrum in its LTE network as soon as the standards and equipment utilizing innovative supplemental downlink technology are available, which AT&T expects to occur by 2014.” Further, page 3 of the Rinne Declaration estimates that “AT&T would be able to deploy handsets and equipment incorporating the Qualcomm Spectrum as early as 2014.”

- i. Discuss in detail how the standards and equipment referenced in the statements above will be developed through 2014. In particular,**

identify each stage of the process for developing standards for this equipment, manufacturing this equipment, testing this equipment and making it available for commercial use.

- ii. Provide specific status and official target dates developed by the 3GPP and other standards organization on the completion of related standards to achieve spectrum aggregation and the frequency band specifications for LTE using the 700 MHz and AWS bands as well as other spectrum scenarios mentioned in the Public Interest Statement and the declarations.**

RESPONSE:

AT&T currently estimates that handsets and equipment incorporating the Qualcomm Spectrum will be available in the 2014-2015 time frame. AT&T describes below the standards that must be released before equipment is manufactured; the timeline for the design and manufacture of equipment; and the timeline for AT&T to test, certify and begin to deploy the equipment to its customers.

Based on information available at the time we prepared this filing, AT&T understands that the basic LTE technical specifications necessary for supplemental downlink are expected to be completed in June of this year with the completion of 3GPP LTE Release 10. The next release (Release 11) will address supplemental downlink in specific band combinations.

AT&T is one of a number of carriers that have requested a specification as part of Release 11. Specifically, with respect to the Qualcomm Spectrum, AT&T has requested a specification that will recognize the Qualcomm Spectrum as a new band class and permit the bonding of that spectrum with AT&T's 1900 MHz spectrum. This item is being considered for inclusion in Release 11 at the RAN Plenary meeting.

Due to the large number of carriers requesting specifications, the RAN working group has to consider prioritization of work under the various scenarios. Thus, there is a chance that not all requested specifications will be done by the same date. Additional operators might seek

specifications during the current RAN Plenary. AT&T has requested a completion date of March 2012 for the Qualcomm Spectrum/1900 MHz specification, and a completion date of June 2012 for the underlying protocol messaging testing of the specification. It is estimated that the 3GPP will release Release 11 in December 2012.

Located at Attachment 13 is a chart setting forth the estimated completion dates for other band combinations pending before the RAN as of May 30th.

At the time AT&T filed its Public Interest Statement, AT&T indicated it planned to bond the Qualcomm Spectrum initially with AT&T's AWS spectrum, but that it also could bond the spectrum with its 1900 MHz and 850 MHz spectrum. While AT&T is currently seeking a specification for the Qualcomm Spectrum/1900 MHz combination, AT&T still currently plans to obtain 3GPP specifications for the bonding of the Qualcomm Spectrum with the AWS and 850 MHz spectrum. After the filing of the Public Interest Statement and further refinement of its LTE network planning, AT&T concluded that it would be better to bond the Qualcomm Spectrum initially with its 1900 MHz spectrum since that spectrum would be more widely available throughout the LTE network footprint. Depending on available capacity and subscriber migration in a market as well as the availability of compatible hardware, software, and devices, AT&T may be able to clear a portion of its 850 MHz spectrum in a market for LTE in later deployment stages.

AT&T currently estimates that handset and base station manufacturers will commence product development upon the release of the Qualcomm/1900 MHz specification in December 2012, and that they will make equipment available for AT&T to test and certify roughly 18 months later -- or by mid-2014. AT&T estimates that it will take it approximately six months -- or until the end of 2014 -- to test and certify the new equipment. During this six-month period,

handsets and base station equipment will first be tested independently in the lab using test equipment emulators and other methods to simulate the respective other end of the link. In parallel with that activity, modifications can be made to the network, primarily to the base station equipment, which will consist of software updates and possibly some hardware modifications. When the lab testing and network modifications are complete, then actual network testing can commence with the actual base station equipment communicating over the air with actual handsets. Such testing will include making sure AT&T's network is compatible with the various new handsets incorporating the new spectrum blocks. Thus, AT&T estimates that it will begin to roll the equipment to its customers by roughly the end of 2014 or the beginning of 2015.

This timeframe is dependent on actions beyond AT&T's control, including how quickly the relevant 3GPP standards and specifications are released and how soon manufacturers make equipment available.

14. REQUEST:

With reference to page 7 of the Public Interest Statement, regarding AT&T's plans to promote "full and efficient utilization of the Qualcomm Spectrum," discuss in detail how this transaction would affect AT&T's service offerings and coverage and capacity in rural as well as urban and suburban areas for both mobile and fixed users. Provide the definition of "urban," "suburban," and "rural" used in answering this question.

RESPONSE:

In the AT&T/ T-Mobile USA proceeding, AT&T has committed to extend its deployment of LTE service to over 97 percent of the U.S. population, including residents of numerous rural and other smaller communities. In fact, a substantial number of the build-outs will be in non-urban areas. Moreover, AT&T will use the same LTE technology throughout the country, and, subject only to spectrum constraints, LTE subscribers in rural areas and small communities will experience the same benefits as subscribers in urban areas.

Similarly, AT&T has no current plans to deploy the Qualcomm Spectrum on the LTE network in a manner that will result in services varying by geographic area. AT&T has no plans for new services as a result of the acquisition of the Qualcomm Spectrum, but customers will experience an improvement in LTE service as described in Request No. 5. AT&T also has no plans to use the Qualcomm Spectrum to expand its LTE coverage; the spectrum will be used to expand capacity on AT&T's then-existing LTE system. Thus, service or coverage will not depend on whether the LTE network is in a rural, urban or suburban area.

Similarly, AT&T will roll out the Qualcomm Spectrum first in those areas where it has an immediate need for additional capacity. Such areas may be in a rural, urban or suburban area. AT&T describes in its response to Request No. 11 how the Qualcomm Spectrum can be used to expand LTE downlink capacity. AT&T's current plans for utilization of the spectrum are not dependent on whether the spectrum is in a rural, urban or suburban area.

AT&T also has no current plans to utilize the Qualcomm Spectrum for fixed mobile services. However, how much spectrum is available and what AT&T can combine it with is going to vary from geographic area to geographic area. Thus, while AT&T is not currently planning service differences, the capacity available in an area may impact, for example, throughput speeds.

Because AT&T has no current plans that would distinguish its use of the Qualcomm Spectrum on a rural, urban or suburban basis, AT&T has not adopted definitions of "urban," "suburban" and "rural" for that purpose.

15. REQUEST

On pages ii and iii of the Joint Opposition, the Applicants state that “this transaction will stimulate competition, foster innovation, and advance the country’s position globally by providing AT&T additional spectrum capacity to compete with other carriers rolling out LTE mobile broadband services.” Explain this statement in detail, by providing all documents discussing this issue and by providing specifics as to how this transaction will stimulate competition among competing providers, foster innovation, and advance the interests of the United States globally, as compared with the circumstances absent the Proposed Transaction. Explain separately any incremental impact of the Proposed Transaction assuming that the proposed AT&T/Deutsche Telekom-T-Mobile merger has been approved. Provide all documents discussing these issues.

RESPONSE:

As AT&T has previously explained, AT&T intends to bond the Qualcomm Spectrum with paired spectrum in its LTE network as soon as the standards and equipment using innovative supplemental downlink technology are available, which AT&T expects to occur no earlier than late 2014. Once the LTE Advanced standards are completed, supplemental downlink technology will permit the bonding of noncontiguous spectrum, including unpaired spectrum, into a single wider channel. As a result, AT&T will be able to add downlink capacity to handle downloads on its LTE network by combining Qualcomm’s unpaired 700 MHz spectrum with paired spectrum that AT&T will use to deploy LTE.

The use of supplemental downlink technology will improve AT&T’s ability to accommodate its customers’ asymmetrical use of broadband data services. In today’s wireless broadband environment, consumers download far more information than they upload. The faster speeds of LTE networks are expected to make many data-intensive services more popular, including streaming video, gaming, and cloud computing, and many of these services inherently involve disproportionate data flows from the network to the consumer. For example, the growth of higher resolution displays in wireless handhelds and tablets results in higher download traffic to match the resolution of the display. Even many everyday wireless services, however, are

characterized by this same asymmetry. A consumer using simple web browsing usually downloads more information than he uploads. The same is true of email – one person may upload a large attachment, but often multiple recipients will open and download that same attachment. By adding the Qualcomm Spectrum to the LTE network, AT&T will be able to offer faster peak download speeds and a more seamless experience for these services that require the downloading of large amounts of data.

AT&T's acquisition of this spectrum for supplemental downlink uses will help increase competition. AT&T will use the spectrum to increase the downlink capacity of its LTE network, which will enable it to serve more customers and to provide better and faster services. The ability to provide these benefits will help make AT&T a stronger LTE competitor. Indeed, the principal effect of the transaction is to increase the capacity of AT&T's LTE network, which will permit AT&T to *increase output* – which is a pro-competitive outcome that should put downward pressure on prices throughout the industry. The transaction does not affect the spectrum holdings of any other wireless carrier, and as explained in AT&T's previous pleadings, in no instance will the acquisition of the Qualcomm Spectrum alone cause AT&T to exceed the Commission's current spectrum screen. While this transaction will help make AT&T a stronger competitor, AT&T's continuing ability to compete will depend on AT&T obtaining additional capacity as consumer demand for data-rich applications and services grow. This transaction will help in that regard, but it will not resolve AT&T's future capacity needs.

The transaction will also foster innovation. Innovation in the wireless industry is a complex, interdependent process that depends, at its core, on networks that have sufficient capacity to support new devices and services. Network operators compete to attract customers by offering the best combinations of speed, reliability, coverage, devices, applications, prices,

and packages, and they are constantly innovating to improve and upgrade their network platforms. These network improvements enable the development and deployment of new, more innovative devices and applications. As customers adopt new devices and applications, demand for wireless service increases, thus spurring network operators to improve their networks even further. This generates a “virtuous cycle” of innovation, because improved networks spur yet more improved devices and applications, which in turn spur yet more improved networks, and so on. Without increased industry output, performance of wireless networks will suffer, slowing the virtuous cycle. The increased efficiencies and outputs provided from AT&T’s use of this spectrum will stimulate the virtuous cycle.

AT&T plays an important role in that virtuous cycle of innovation. A major part of AT&T’s business strategy is to be at the leading edge of wireless technology. AT&T Labs is a world-class research institution with six labs in five states supporting 1,300 of the world’s best scientists and engineers. AT&T was awarded more than 1,000 patents in 2010, and AT&T ranked third on the Patent Board’s top 50 scorecard of technology leaders in the telecom and communications industry – the only wireless service provider in the top 10. AT&T also maintains sophisticated testing and product development and engineering centers, including facilities established to promote collaboration with developers and manufacturers. Through these initiatives and others, AT&T promotes innovation throughout the wireless ecosystem, and AT&T’s constant network improvements and broad efforts in research and collaborative outreach are an important part of that innovative process.

Given AT&T’s role in the innovative process, the transaction should foster additional innovation by expanding the marketplace opportunities and incentives to develop cutting-edge LTE services. By adding supplemental downlink technologies to AT&T’s network, AT&T will

be able to accommodate data-intensive services more easily and consumers will enjoy better, faster, and more seamless delivery of such services. This expanded capacity will increase AT&T's incentives to engage in research and collaborative efforts with other innovators throughout the ecosystem, because it can encourage the growth of such services with increased confidence that it will have the network capacity necessary to handle such services. By the same token, the increased downlink capacity on AT&T's network will increase incentives for device makers and applications developers to design more innovative services that will run on such networks – particularly more data-intensive services like streaming video, gaming, and cloud computing. And, past experience confirms that innovative successes will spur other carriers, device makers, and applications designers to redouble their efforts to respond with innovations of their own – with consumers as the chief beneficiaries.

For many of the same reasons, the transaction will advance the country's position globally. Qualcomm, a United States company, has developed an innovative supplemental downlink technology. AT&T, a United States company, will be among the first to deploy it commercially, which is a boost to U.S. wireless leadership.

By enhancing AT&T's ability to provide innovative services that require large downloads of data, the transaction enhances AT&T ability to remain a leader in the wireless industry both as a strong competitor and as an important driver of innovation. To the extent that the transaction maintains or enhances AT&T's incentives to engage in proactive collaboration with other innovators throughout the wireless ecosystem, that American-based leadership will be felt throughout the globe, as AT&T participates in international standards-setting bodies and collaborates with international device makers and software designers that offer their products and services across the world.

Finally, the Proposed Transaction has the potential for an even more beneficial incremental impact on competition and innovation if the AT&T's merger with T-Mobile USA is approved. The two transactions are entirely complementary. As AT&T has explained elsewhere, the merger with T-Mobile USA will facilitate substantial increases in network capacity that will allow the combined company to offer LTE services to an additional 55 million customers. Accordingly, the merger with T-Mobile USA should increase the scope of opportunities in which the Qualcomm Spectrum could potentially be bonded with AT&T's LTE spectrum, thus increasing the downlink capacity available to additional consumers. To the extent that the Qualcomm Spectrum can be used for supplemental downlink in additional markets, the benefits to competition and innovation described above would be further enhanced. However, the unpaired spectrum that is the subject of this transaction will not solve AT&T's total spectrum and capacity needs.

AT&T will provide documents responsive to this request, if any, at a later date.

16. REQUEST:

On page 6 of the Public Interest Statement, the Applicants state that "the market has shown that the Lower 700 MHz D and E blocks cannot and will not be put to full and efficient use as stand-alone one-way 6 MHz licenses." On page 7 of the Public Interest Statement, the Applicants state that "there is a risk that the unpaired Lower 700 MHz D and E blocks will remain under-utilized unless they can be used in conjunction with other paired spectrum to enhance broadband capacity." Provide all documents discussing how to make use of this spectrum and efforts by standard-setting organizations and equipment manufacturers to facilitate use, including documents discussing the efforts of existing licensees of the Lower 700 MHz Band, including D and E block licensees.

RESPONSE:

AT&T will provide documents responsive to this request, if any, at a later date.

17. REQUEST:

On page 30 of the Public Interest Statement, the Applicants assert that the market for wireless services is “robustly competitive, and that this transaction will not change that,” and that there is “no shortage of competition in advanced mobile broadband services.” In particular, with regard to spectrum holdings, the Applicants state on pages 30-33 that T-Mobile as well as the other two nationwide providers — have “sufficient spectrum to roll out 4G service.” The Applicants also assert on page 31 that T-Mobile “holds 50.4 MHz of spectrum on a nationwide average basis, which is proportionately more than AT&T given that T-Mobile supports a consumer base slightly more than one third of the size of AT&T’s.” The Applicants note as well on page 33 that T-Mobile “has announced plans to double the speed of its 4G network in order to bring speeds of up to 42 Mbps to 140 million people by the end of the year.” In light of those assertions:

- i. Explain, and provide all documents discussing how much spectrum is necessary to roll out competitive 4G services. Provide the definition of “4G” used in answering this question.
- ii. Explain, and provide all documents discussing whether some or all of the three other nationwide providers have the spectrum necessary to roll out competitive 4G services and networks in the timeframe specified in the Public Interest Statement. Provide the definition of “4G” used in answering this question.
- iii. Provide all documents discussing the competitive significance of each provider mentioned in your Public Interest Statement, on a provider-by-provider basis.

This information should be provided separately (a) for the baseline case (i.e., absent both the Proposed Transaction and the proposed AT&T/Deutsche Telekom-T-Mobile merger), (b) for circumstances as set forth in the Proposed Transaction (i.e., absent any AT&T/Deutsche Telekom-T-Mobile merger), and (c) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

Three technologies offering speeds significantly faster than 3G have been deployed in the United States and labeled as 4G: LTE, WiMAX, and HSPA+ with enhanced backhaul. LTE and WiMAX will be competitive technologies for many years to come. HSPA+ is approaching the end of its development cycle and will be overtaken by competing technologies. LTE, for example, offers faster peak data speeds, greater spectral efficiency, and reduced latency.

Spectrum requirements to roll out a competitive 4G offering depend on the size of a carrier's customer base, relative data usage levels, and service quality expectations. AT&T -- with its large customer base, industry leading smartphone penetration and correspondingly heavy data usage, and high service quality expectations -- has greater spectrum requirements than carriers not similarly situated.

The Proposed Transaction and the AT&T/ T-Mobile USA transaction will not affect Verizon's or Sprint's access to spectrum needed to roll out 4G offerings -- neither carrier was using, or had any publicly announced plans to use, any of the spectrum involved in these transactions for their 4G offerings. Both Verizon and Sprint are well positioned from a spectrum standpoint to respond to the improved AT&T service offerings that will be enabled by these transactions.

Verizon recently reaffirmed that it is "very happy in [its] current spectrum position."²³ As Verizon's CEO has said, Verizon is "extremely confident" that it has the "spectrum position" it needs. Verizon has a nationwide 22 MHz license in the Upper 700 MHz band, which will permit it to provide LTE service with a 10 MHz uplink and 10 MHz downlink.

Sprint, through its majority stake in Clearwire, has access to more spectrum (about 186 MHz)²⁴ than any other carrier -- including AT&T, even after the consummation of both this transaction and the T-Mobile USA transaction. To quote Sprint's CEO Dan Hesse, "When you combine Sprint's spectrum position with Clearwire's spectrum position it put[s] us in the

²³ Victor Godinez, *Verizon Exec Weighs in on AT&T/T-Mobile Deal, Spectrum Shortage*, Dallas News (May 22, 2011) <http://www.dallasnews.com/business/technology/headlines/20110522-verizon-exec-weighs-in-on-attt-mobile-deal-spectrum-shortage.ece>.

²⁴ *In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993*, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, 25 FCC Rcd. 11,407, 11,568, ¶ 267, Table 26 (2010).

strongest place for the future.”²⁵ As Clearwire says on its website, Clearwire has “more spectrum than anyone.”²⁶ Clearwire is planning to deploy LTE in 40 MHz increments, with 20 MHz for the upload and 20 MHz for the download. Clearwire notes that this is “twice the size of other carriers” and is why its “download speeds are so much faster than theirs.”²⁷ As Clearwire explains: “It’s like the number of lanes on a freeway. We have more lanes, which means we can move more traffic at higher speeds.”²⁸ Clearwire’s WiMAX deployment has been similarly expansive. Making use of its “deep spectrum position”²⁹ Clearwire appears to deploy between three and six 10 MHz channels, depending on the market.³⁰ Clearwire describes its WiMAX offering as “super-fast,”³¹ and notes that its customer base has grown by 533% in the last year.³²

AT&T will provide documents responsive to this request, if any, at a later date.

²⁵ Andrew Munchbach, *Live from CTIA 2010’s Day Two Keynote with Sprint CEO Dan Hesse*, BGR, <http://www.bgr.com/2010/03/24/live-from-ctia-2010%E2%80%99s-day-one-keynote-with-sprint%E2%80%99s-dan-hesse/> (Mar. 24, 2010).

²⁶ Clearwire, *Our Network*, <http://www.clearwire.com/company/our-network> (last visited June 2, 2011).

²⁷ Clearwire, *4G LTE Technology Trials*, <http://www.clearwire.com/company/featured-story> (last visited June 2, 2011).

²⁸ *Id.*

²⁹ Clearwire, *Our Company*, <http://www.clearwire.com/company/our-company> (last visited June 2, 2011).

³⁰ *AT&T: T-Mobile’s Spectrum Needed to Future-Proof 4G Networks*, Sidecut Reports, <http://www.sidecutreports.com/2011/03/22/att-t-mobiles-spectrum-needed-to-future-proof-4g-networks/> (Mar. 22, 2011); *Clearwire + T-Mobile?*, Dailywireless.org, <http://www.dailywireless.org/2010/09/02/clearwire-t-mobile/> (Sept. 2, 2010).

³¹ CLEAR, *What is CLEAR?*, <http://www.clear.com/discover> (last visited June 2, 2011).

³² CLEAR, *Hard Work Really Pays Off*, CLEAR Blog, <http://www.clear.com/blog/hard-work-really-pays-off/> (May 4, 2011).

18. REQUEST:

On pages 34-35 of the Public Interest Statement, the Applicants state that MetroPCS has already launched 4G LTE service in certain metropolitan areas, and that LightSquared is expected to begin rollout of LTE services beginning later this year. On page 35 of the Public Interest Statement, the Applicants state that “other regional providers have sufficient spectrum to provide mobile broadband services,” and pages 35-38 specifically mention Cricket (a subsidiary of Leap Wireless), U.S. Cellular, nTelos, Allied Wireless Communications, Cellular South, and Cox. With respect to those assertions, discuss in detail, with respect to each of these providers, how the provider would have sufficient spectrum to compete with AT&T in the provision of these mobile wireless services. This information should be provided separately (a) for circumstances as set forth in the Proposed Transaction (i.e., absent any AT&T/Deutsche Telekom-T-Mobile merger); and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

We discuss below how MetroPCS, LightSquared, Cricket, U.S. Cellular, nTelos, Allied Wireless Communications, Cellular South and Cox have access to sufficient spectrum to compete with AT&T in the provision of 4G LTE services. Neither the Proposed Transaction nor the AT&T/ T-Mobile USA transaction will affect these carriers’ access to spectrum -- none of these carriers was using, or had any publicly announced plans to use, any of the spectrum involved in either transaction for 4G LTE services.

MetroPCS says that it “introduced the first commercial 4G LTE service in the United States” in its Las Vegas and Dallas/Ft. Worth markets in September 2010.³³ MetroPCS currently offers what it describes as “[f]ull service talk and text, Web, email and multimedia at 4G speeds” in the following markets: Atlanta, Boston, Dallas/Ft. Worth, Detroit, North Florida/Jacksonville, Central Florida/Tampa and Orlando, South Florida, Las Vegas, Los Angeles/Bakersfield, New York, Philadelphia, Sacramento, and San Francisco.³⁴ MetroPCS is “deploying 4G LTE on PCS

³³ MetroPCS Communications, Inc., Annual Report (Form 10-K) at 7 (Mar. 1, 2011).

³⁴ MetroPCS, Map of 4G LTE Coverage, <http://www.metropcs.com/4g/coverage/> (last visited June 2, 2011).

and AWS spectrum.”³⁵ MetroPCS’s current plan is “to reach approximately 100% coverage” across its existing footprint for its 4G LTE by the end of 2011.³⁶ The size of MetroPCS’s 4G LTE deployment depends on the availability of spectrum and ranges up to 20 MHz, with 10 MHz for the uplink and 10 MHz for the downlink. MetroPCS describes its spectrum portfolio as one of its “competitive strengths that distinguish[es] us from our principal wireless competitors.”³⁷ MetroPCS supplements its own spectrum portfolio with a roaming arrangement with Cricket. According to press reports, MetroPCS has been considering further strengthening its spectrum portfolio by purchasing out of bankruptcy TerreStar, which has significant holdings of MSS ATC spectrum.³⁸

LightSquared is building a 4G LTE network that will provide service for resale to others. It is “currently conducting technical testing which will run through 2011.”³⁹ The CEO of LightSquared said that the company “plans to offer wholesale nationwide 4G networks to wireless phone service providers, game makers and many others” in the second half of 2011,⁴⁰ and its “customers are expected to launch services in the first half [of] 2012.”⁴¹ LightSquared estimates that its nationwide network, consisting of 40,000 cellular base stations, “will cover

³⁵ MetroPCS Communications, Annual Report (Form 10-K) at 35 (Mar. 1, 2011).

³⁶ MetroPCS, Bank of America Credit Conference, Nov. 17, 2010, at 16, *available at* <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NDA3MjY1fENoaWxkSUQ9NDE2NjIzFR5cGU9MQ==&t=1>.

³⁷ MetroPCS Communications, Annual Report (Form 10-K), at 6 (Mar. 1, 2011).

³⁸ Phil Goldstein, Report: MetroPCS interested in TerreStar’s spectrum, Fierce Wireless, Dec. 16, 2010, <http://www.fiercewireless.com/story/report-metropcs-interested-bankrupt-terrestars-assets/2010-12-16>.

³⁹ LightSquared, Nationwide LTE Broadband Network, <http://www.lightsquared.com/what-we-do/network/> (last visited June 1, 2011).

⁴⁰ CNBC.com, LightSquared Plans to Offer 4G Nationwide: CEO (Mar. 23, 2011), <http://www.cnbc.com/id/42229328>.

⁴¹ LightSquared, Nationwide LTE Broadband Network, <http://www.lightsquared.com/what-we-do/network/> (last visited June 1, 2011).

92 percent of the U.S. population by 2015.”⁴² LightSquared intends to use “terrestrial and satellite technology” to ensure connectivity. LightSquared launched a satellite in November 2010⁴³ and obtained FCC approval to use its satellite to provide wireless service in January 2011.⁴⁴ Best Buy has signed a deal to become a mobile virtual network operator on LightSquared’s network.⁴⁵ LightSquared has entered 4G roaming agreements with Cellular South,⁴⁶ Cricket,⁴⁷ and SI Wireless (a partnership of rural independent telephone companies).⁴⁸ LightSquared has “59 MHz of nationwide ubiquitous spectrum in an advantageous frequency position.”⁴⁹ According to press reports, LightSquared and Sprint are close to entering into an arrangement in which LightSquared would pay \$2 billion a year for eight years for access to

⁴² *Id.*

⁴³ *Id.*

⁴⁴ Press Release, LightSquared, LightSquared Statement on the Federal Communications Commission Conditional Waiver of the Ancillary Terrestrial Component (ATC) Integrated Service Rule (Jan. 26, 2011), <http://www.lightsquared.com/press-room/press-releases/lightsquared-statement-on-the-federal-communications-commission-conditional-waiver-of-the-ancillary-terrestrial-component-atc-integrated-service-rule/>; Cecilia Kang, FCC grants LightSquared approval to use satellite airwaves for cell phones, Washington Post: Post Tech (Jan. 26, 2011), http://voices.washingtonpost.com/posttech/2011/01/the_federal_communications_com_9.html.

⁴⁵ Dan Jones, CTIA 2011: LightSquared Leaps Into Best Buy Deal, Light Reading Mobile (Mar. 23, 2011), http://www.lightreading.com/document.asp?doc_id=205971.

⁴⁶ Press Release, LightSquared, LightSquared and Cellular South Announce They Have Entered Into a Bilateral Roaming Agreement (Apr. 20, 2011), <http://www.lightsquared.com/press-room/press-releases/lightsquared-and-cellular-south-announce-they-have-entered-into-a-bilateral-roaming-agreement/>.

⁴⁷ Press Release, LightSquared, Cricket Enters into 4G Roaming Agreement with LightSquared (Mar. 22, 2011), <http://www.lightsquared.com/press-room/in-the-news/cricket-enters-into-4g-roaming-agreement-with-lightsquared/>.

⁴⁸ Press Release, LightSquared, LightSquared and SI Wireless Announce They Have Entered Into a Bilateral Roaming Agreement (Apr. 21, 2011), <http://www.lightsquared.com/press-room/press-releases/lightsquared-and-si-wireless-announce-they-have-entered-into-a-bilateral-roaming-agreement/>.

⁴⁹ LightSquared, Our Investors, <http://www.lightsquared.com/about-us/our-investor/> (last visited June 2, 2011).

Sprint cell sites where LightSquared would build out LTE using LightSquared's own spectrum.⁵⁰

LightSquared has not changed its timeframe for launching its 4G LTE network as a result of ongoing testing concerning interference between its system and GPS (Global Positioning System) receivers.⁵¹

Cricket has said that it “plan[s] to deploy next-generation LTE network technology over the next few years, with a commercial trial market to be launched in late 2011.”⁵² Cricket's CEO said that it would roll out 4G in limited amounts in 2011 and increase coverage in 2012 and 2013.⁵³ He also said that Cricket does not plan to build an entire 4G network on its own.⁵⁴ In March 2011, Cricket entered into a 4G roaming agreement with LightSquared.⁵⁵ Cricket holds PCS and AWS spectrum, as described in Appendix B to the Public Interest Statement.

U.S. Cellular plans “to launch LTE in 24 markets by November [2011], which will cover 25% to 30%” of U.S. Cellular subscribers.⁵⁶ These 24 markets are concentrated in Iowa,

⁵⁰ Reuters, *Lightsquared Near \$2 Billion A Year Sprint Deal: Sources* (June 1, 2011), available at <http://www.reuters.com/article/2011/06/01/us-sprint-lightsquared-idUSTRE7505GB20110601>; Phil Goldstein, *Report: Sprint, Lightsquared Near \$2B/Year Network-Sharing Deal*, Fierce Wireless (June 2, 2011), available at <http://www.fiercewireless.com/story/report-sprint-lightsquared-near-2byear-network-sharing-deal/2011-06-02>.

⁵¹ Paul Kirby, *LightSquared Hasn't Changed Launch Date Due to GPS Interference Testing Process*, TR Daily (June 1, 2011), <http://www.tr.com/online/trd/2011/td060111/td060111-10.htm#TopOfPage>.

⁵² Leap Wireless International Inc., Annual Report (Form 10-K), at 3 (Feb. 25, 2011).

⁵³ *Leap CEO: We plan LTE 'Hotspots' Next Year*, FierceWireless (Dec. 8, 2010), <http://www.fiercewireless.com/story/leap-ceo-we-plan-lte-hotspots-next-year/2010-12-08>.

⁵⁴ *Id.*

⁵⁵ LightSquared, Cricket Enters into 4G Roaming Agreement with LightSquared (Mar. 22, 2011), <http://www.lightsquared.com/press-room/in-the-news/cricket-enters-into-4g-roaming-agreement-with-lightsquared/>.

⁵⁶ U.S. Cellular, Q1 2011 Telephone And Data Systems Inc Earnings Conference at 4 (May 6, 2011) (statement by Mike Irizarry, U.S. Cellular, EVP, CTO).

Wisconsin, eastern North Carolina, and Maine,⁵⁷ but the launch will also include markets in Texas and Oklahoma.⁵⁸ “The deployment will utilize 700 MHz spectrum and involve approximately 1,250 cell sites.”⁵⁹ U.S. Cellular plans to “expand the deployment of LTE in 2012 and beyond,”⁶⁰ but it has not identified the timing of this second wave of LTE deployment.⁶¹ U.S. Cellular began “technical trials of LTE” in late 2009 and “anticipates completing these trials in 2011.”⁶²

Cellular South announced in November 2010 that it will launch an LTE network in its footprint in the southeastern United States by the end of 2011.⁶³ Cellular South entered a 4G roaming agreement with LightSquared in April 2011.⁶⁴ Cellular South plans to implement its network with its 700 MHz spectrum.⁶⁵

⁵⁷ *Id.*

⁵⁸ Press Release, U.S. Cellular, U.S. Cellular to Launch 4G LTE Service and Devices in Time for the Holiday (May 6, 2011), <http://phx.corporate-ir.net/phoenix.zhtml?c=106793&p=irol-newsArticle&ID=1560901>.

⁵⁹ Mike Irizarry, Executive Vice President, Chief Technology Officer, U.S. Cellular, TDS and U.S. Cellular First Quarter Results Conference Call (May 6, 2011) (“*U.S. Cellular Q1 Call*”).

⁶⁰ United States Cellular Corp., Annual Report (Form 10-K) at 7 (Feb. 25, 2011) (“*U.S. Cellular 2011 10-K*”).

⁶¹ *U.S. Cellular Q1 Call* at 14-15.

⁶² *U.S. Cellular 2011 10-K* at 6.

⁶³ Kevin Fitchard, Cellular South launching LTE with Samsung, Connected Planet Unfiltered (Nov. 17, 2010), <http://blog.connectedplanetonline.com/unfiltered/2010/11/17/cellular-south-launching-lte-with-samsung/>.

⁶⁴ LightSquared, LightSquared and Cellular South Announce They Have Entered Into a Bilateral Roaming Agreement (Apr. 20, 2011), <http://www.lightsquared.com/press-room/press-releases/lightsquared-and-cellular-south-announce-they-have-entered-into-a-bilateral-roaming-agreement/>.

⁶⁵ Mike Dano, Verizon Blasts Cellular South’s LTE Plans, Argues Against Federal Oversight, The Motley Fool (Dec. 3, 2010), <http://www.fool.com/investing/general/2010/12/03/verizon-blasts-cellular-souths-lte-plans-argues-ag.aspx>.

nTelos completed an end-to-end 4G LTE field trial in April 2011, in cooperation with Alcatel-Lucent.⁶⁶ Although nTelos did not specify which spectrum it used for this trial, it owns AWS spectrum that covers 1.37 million POPs, as well as PCS spectrum.⁶⁷

Allied Wireless Communications/ATN reports that it is “currently conducting technical evaluations of Long Term Evolution (‘LTE’) or ‘4G’ technology, to further improve [its] network.”⁶⁸ In April 2011, ATN formed a joint venture with the Navajo Tribal Utility Authority to contribute network-related assets to provide last mile services through a 4G LTE network to be constructed with federal stimulus money.⁶⁹ ATN holds cellular and PCS spectrum, as described in Appendix B to the Public Interest Statement.

Cox holds unused AWS and 700 MHz spectrum suitable for LTE and had been conducting LTE tests in Arizona and San Diego in collaboration with Alcatel-Lucent and Huawei. Cox’s vice president of wireless said regarding the tests: “Through the LTE trials, we are utilizing the AWS and 700 MHz spectrum to test voice, data and video applications and services and ultimately readying to deploy 4G wireless broadband services to meet the needs of our customers. We are encouraged by the success of the Phoenix and San Diego tests, which further validate our decision to pursue 4G based on LTE, specifically the 3GPP Release 8

⁶⁶ Alcatel-Lucent, nTelos Wireless and Alcatel-Lucent complete field trial of end-to-end 4G LTE network (Apr. 7, 2011), http://www.alcatel-lucent.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0vM0YQjzKLd4w3MfQFSYGYRq6m-pEoYgbxjgiRIH1vfV-P_NxU_QD9gtzQiHJHR0UAAD_zXg!!/delta/base64xml/L0lJ ayEvUUD3QndJQSEvNEIVRkNBISvNI9BX0U4QS9lbI93dw!!?LMSG_CABINET=Docs_and_Resource_Ctr&LMSG_CONTENT_FILE=News_Releases_2011/News_Article_002403.xml.

⁶⁷ Lynnette Luna, *nTelos tests LTE with Alca-Lu*, Fierce Broadband Wireless (Apr. 10, 2011) <http://www.fiercebroadbandwireless.com/story/ntelos-tests-lte-alca-lu/2011-04-10>.

⁶⁸ Allied Tele-Network, Annual Report (Form 10-K) at 5 (Mar. 16, 2011).

⁶⁹ Allied Tele-Network, Quarterly Report (Form 10-Q) at 19-20 (May. 10, 2011).

standard.”⁷⁰ On May 24, 2011, it was reported that Cox would be providing service through the Sprint Nextel network,⁷¹ but it has not announced what it will do with its 700 MHz and AWS spectrum.⁷²

19. REQUEST:

Page 4 of the Reed and Tripathi Declaration states that “[n]or does it follow that a higher frequency network operator would necessarily have materially higher costs even if more base stations were required to obtain equivalent coverage. While the number of base stations deployed is certainly one important driver of wireless costs, there are many others.”

- i. Describe in detail circumstances in which the many other costs would result in a network operator not having higher costs from use of higher-frequency spectrum.**

The number of base stations that an operator needs is only one of many elements that affects an operator’s overall network costs. At the outset, however, it is important to reiterate that the central point made by Professors Reed and Tripathi is that in today’s wireless networks, the number of base stations in many situations will be driven by *capacity*, not by coverage. Although lower-frequency spectrum has superior propagation characteristics, it is the very coverage advantages of lower-frequency spectrum that lead to capacity disadvantages. In many instances today, a purely coverage-based approach to the placement of base stations would be quickly overwhelmed by the large number of wireless users and the heavy demand they place on the network, and carriers with lower-frequency spectrum will often have to engage in cell-

⁷⁰ Press Release, Cox Communications, Cox Successfully Demonstrates the Delivery of Voice Calling, High Definition Video Via 4G Wireless Technology, *available at* <http://cox.mediaroom.com/index.php?s=43&item=469>.

⁷¹ Stephen Lawson, *Cox to Close Its Own Cell Network, Use Sprint*, PCWorld (May 24, 2011), http://www.pcworld.com/businesscenter/article/228608/cox_to_close_its_own_cell_network_use_sprint.html.

⁷² Jeff Baumgartner, *Speculating About Cox’s Spectrum*, Light Reading Cable (May 26, 2011), http://www.lightreading.com/document.asp?doc_id=208365.

splitting. The end result will often be that the higher-frequency carriers will not have materially more base stations in an area than the lower-frequency carrier.

There are a number of other types of costs which, either independently but often in combination, can offset the propagation advantages of lower frequency spectrum. Some of these include the following: (1) The relative advantages and disadvantages of different types of spectrum are built into the cost of the spectrum itself, and to the extent that higher frequency spectrum requires the construction of more base stations, those higher deployment costs are likely to be reflected in the bids at auction. (2) Higher frequency spectrum is much better at supporting newer technologies that can increase throughput, like MIMO. (3) Carriers like AT&T must support multiple frequencies and technologies (*e.g.*, GSM, UMTS, and LTE), whereas other carriers can lower their overall network costs by skipping certain technologies altogether; thus Clearwire skipped older technologies and built a nationwide WiMAX network, LightSquared has skipped older technologies and is building a nationwide LTE network, and MetroPCS skipped 3G altogether and is constructing an LTE network. (4) Carriers have claimed other cost advantages as well – for example Clearwire has stated that its cell tower costs using 2.5 GHz spectrum are nearly half that of other cell providers.⁷³ (5) Higher frequency spectrum is generally available in wider bands, which may allow an operator to avoid multi-band equipment and other infrastructure costs associated with combining different lower frequency bands to achieve the same bandwidth. (6) There are many other cost categories that may vary from carrier to carrier depending upon business strategy, including customer acquisition, retail distribution, and advertising.

⁷³ See Clearwire Investor Presentation, Feb. 10, 2010, slide 10, *available at* <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9Mjc4NDc1OHx0aGlsZElEPTM3MTE4MXxUeXB IPTI=&t=1>.

In short, the propagation advantages of lower-frequency spectrum do not necessarily mean that a carrier will have overall lower costs than a higher-frequency carrier. Indeed, analysts have recently stated that they believe that MetroPCS's costs are *lower* than AT&T's and Verizon's.⁷⁴

- ii. **Provide underlying link budget assumptions for both the uplink and downlink for bands used or planned to be used by AT&T that are above and below 1 GHz (e.g., PCS, AWS, WCS, 850 MHz and 700 MHz) including (but not limited to):**
 - a. **Assumed transmit power and all gains and losses;**
 - b. **Assumed performance requirements (bit rate) for mobile and pedestrian applications, including corresponding signal to noise ratio requirements;**
 - c. **Indoor penetration losses and other assumptions that may be specific to urban, suburban and rural deployments; and**
 - d. **Fade and other assumed margins.**

RESPONSE:

Although carriers use link budgets as a tool in determining where to place base stations in their networks, link budgets are just that – a tool and a starting point – and they can provide only certain types of information that are relevant to those determinations. In essence, they provide a theoretical estimate of signal loss from the base station given the propagation characteristics of the spectrum and the technology being deployed – in other words, they are most helpful in determining where to locate a base station if the carrier is pursuing a largely coverage-driven deployment. For these reasons, link budgets are most useful at the very beginning of the deployment of a network. As a network matures – and even at early stages of network rollout in

⁷⁴ See, e.g., Scott Woolley, *The upstart company that made the AT&T-mobile merger possible*, Fortune (Mar. 22, 2011), available at <http://tech.fortune.cnn.com/2011/03/22/the-upstart-company-that-made-the-att-mobile-merger-possible>.

high traffic areas – cell site spacing determinations may be primarily driven not by signal strength but by interference issues (in the uplink by interference from other handsets and in the downlink by interference from other base stations).

In addition, there are many other types of considerations not captured in the link budget that have a major effect on where and how many base stations a network operator might deploy in the real world. These additional factors would include such things as: (1) the overall characteristics of the RF environment, including how much “noise” and other interference there is from other devices and handsets in the area as well as other natural and man-made RF emissions, (2) the availability of optimal cell site locations (geographic location, height, orientation, obstructions); (3) the clutter environment (including buildings and other man-made structures and topography, and foliage); (4) which cellular technology (*e.g.*, GSM vs. LTE) is being deployed; (5) topography and the overall physical environment, including whether there are obstructions such as buildings or trees; and (6) the availability and use of MIMO or other technologies that are more effective in higher frequency bands.

For these and other reasons, there is no single, universal link budget for any given spectrum band or even for any given spectrum band for a particular technology. AT&T intends to use the Qualcomm Spectrum in its new LTE network once the relevant standards and equipment are available, and AT&T has conducted some link budget analysis in connection with the initial roll out of that network. AT&T is planning to use its 700 MHz and AWS spectrum for its LTE deployment, and therefore we have provided AT&T’s internal link budget assumptions for the four categories requested for 700 MHz and AWS spectrum.⁷⁵ Our response is in the form

⁷⁵ Although the attached Excel spreadsheet does not separately present link budget assumptions for 800 MHz and 1900 MHz, they are likely to be similar to those for 700 MHz and AWS, respectively.

of a spreadsheet, LTE link budget final.xlsx, which is attached.⁷⁶ The worksheets labeled LTE DL link budget template, and LTE UL link budget template define the values or range of values for the parameters specified in the four categories requested plus additional parameters that are required to conduct a link analysis for the LTE DL and UL, respectively. Values or range of values are shown for operation at 700 MHz and AWS frequency bands, which are designated Band 17 and Band 4, respectively in 3GPP specifications. For each link parameter, a value or range of values is provided along with a brief explanation in the comments column. A number of parameters are calculated from various input parameters and are designated as “Calculation” under the value column. These calculated parameters include the Transmit (TX) bandwidth, TX EIRP, Receive (RX) noise floor, RX sensitivity, and Maximum Allowable Path Loss (MAPL). The corresponding equations are provided for all of these calculated parameters.

In addition, the enclosed Excel file (Attachment 18.ii) also provides example link budgets for the DL and UL for both 700 and AWS bands, for a DL which supports a 1 Mbps bit rate and for an UL that supports 256 kbps, where both DL and UL assume a 5 MHz LTE channel bandwidth. These examples are contained in the worksheets labeled LTE DL link budget 700&AWS, and LTE UL link budget 700&AWS, respectively. The MAPL is calculated for each of the four possible links, **[Begin Highly Confidential]**

[End Highly Confidential]

⁷⁶ See Attachment 19.ii.

Finally, there are a number of subtleties associated with LTE link budget analysis and we have identified many of them in the comments column. The required Signal to Noise Ratio (“SNR”) to support a given bit rate is typically commercially sensitive information, as this is one of the areas where the LTE infrastructure vendors attempt to differentiate themselves. The SNR values used in the examples represent a blend of inputs from various sources, and as noted in the comments, the value is dependent upon a number of variables, which could ultimately lead to quite a bit of variability in the value assumed. Also, some LTE link budgets may include a Frequency Selective Scheduling (“FSS”) gain for the UL, and a handoff gain, or what might be more appropriately called a best server selection gain for both the DL and UL. **[Begin Highly Confidential]**

[End Highly Confidential] The FSS gain is the result of the UL scheduler being able to select the best resource blocks for a given user. **[Begin Highly Confidential]**

[End Highly Confidential] A handoff gain may be realized by a mobile device at the cell edge that can handoff to a neighboring cell with more favorable shadowing, *i.e.* lower path loss. **[Begin Highly Confidential]**

[End Highly Confidential] Note this latter gain is achieved even though LTE does not have a soft handoff capability as in CDMA or WCDMA.

20. REQUEST:

Provide all documents, data and analysis cited in the Public Interest Statement and the declarations of David Wise, Kristin S. Rinne, Professor Jeffrey H. Reed and Dr. Nishith D. Tripathi, and all documents and data relied upon in preparing those documents, grouped by declaration/Public Interest Statement as stated in Instruction number 6. To the extent the information has already been provided, specify the response to which it was also submitted.

RESPONSE:

AT&T will provide documents, data and analysis cited in the declaration of Kristin S. Rinne and declaration Professor Jeffrey H. Reed and Dr. Nishith D. Tripathi, and all documents and data relied upon in preparing them, at a later date. Documents, data and analysis cited in the declaration of David Wise, and all documents and data relied upon in preparing it, will be provided separately by Qualcomm in its response to the Request.

21. REQUEST:

Provide all documents discussing AT&T's valuation(s) of Qualcomm's spectrum assets. Include any valuations of Qualcomm's spectrum assets in the absence of the proposed AT&T/Deutsche Telekom-T-Mobile merger, as well as any valuations assuming that proposed merger has been approved. Provide all documents discussing the cost and relative valuation of any spectrum license the AT&T considered acquiring or acquired in the secondary market.

RESPONSE:

AT&T will provide documents responsive to this request, if any, at a later date.

22. REQUEST:

Provide all strategic plans, policies, analyses, reports and presentations discussing the Qualcomm spectrum and its expected use.

RESPONSE:

AT&T will provide plans, analyses and reports responsive to this request, if any, at a later date.

23. REQUEST:

Provide all documents discussing presentations to management committees, executive committees, boards of directors, investors, investor analysts, and industry analysts regarding the effect of the Proposed Transaction, including the effect on AT&T's spectrum constraints and business plans, (a) for circumstances as set forth in the Proposed Transaction (i.e., absent any AT&T/Deutsche Telekom-T-Mobile merger), and (b) for circumstances that assume the AT&T/Deutsche Telekom-T-Mobile merger has been approved.

RESPONSE:

AT&T will provide documents responsive to this request, if any, at a later date.

24. REQUEST:

Provide all strategic plans, policies, analyses, reports and presentations discussing how AT&T evaluates and monitors capacity, including the amount of spectrum, speed of connection, and facilities (including, cell site configuration and backhaul) that are required to meet consumer demand.

RESPONSE:

AT&T will provide plans, analyses and reports responsive to this request, if any, at a later date.

25. REQUEST:

Provide all strategic plans, policies, analyses, reports and presentations discussing AT&T network traffic — including network traffic statistics and current and projected data on traffic loads in both the uplink and downlink directions — for your current and projected customer base, and the corresponding technologies and services currently used or projected to be used through 2014.

RESPONSE:

AT&T will provide plans, analyses and reports responsive to this request, if any, at a later date.

26. REQUEST:

Provide copies of the following AT&T documents that were provided to the Department of Justice:

- i. Proposed Solution for the Low 700 MHz Band (dated August 13, 2010);**
- ii. Spectrum Band Plan Strategy, Spectrum Steering Committee (dated August 30, 2010);**
- iii. Playbook for Wireless Network Quality Impact (not dated): Bates number AT&T00001;**
- iv. Spectrum Acquisition Estimates (not dated): Bates number AT&T00037;**
- v. AT&T Inc. Acquisition of 700MHz Spectrum from Qualcomm Inc. (Arnold & Porter dated Jan 14, 2011);**
- vi. December 2010 Spectrum Activity Summary (not dated): Bates number AT&T000207- 216 ;**
- vii. Wireless Evolution: Supply/Demand Analysis: Bates number AT&T00140-00173 (March 8, 2010);**
- viii. LTE 250M POPs by 2013- LTE “Largely Complete by 2013” Plan 8k/16k/20k=44k nodes - RAN fundamental Planning: Bates number AT&T00174-00206 (January 11, 2011);**
- ix. Spectrum Acquisition Estimates: Bates number AT&T00037-00054 (August 3, 2010); and**
- x. Tabular Data (including data on number of base stations, number of subscribers, and spectrum and demand requirements): Bates number AT&T00055-000139.**

RESPONSE:

AT&T will provide these documents at a later date.

Attachment 1.1

In Response to Request 1

**This entire attachment consisting of
1.1-1 through 1.1-43 has been
redacted.**

Attachment 2(a).1
In Response to Request 2(a)

This entire attachment consisting of 2(a).1-1 through 2(a).1-1198 has been redacted.

Attachment 2(c).1
In Response to Request 2(c)

This entire attachment consisting of 2(c).1-1 through 2(c).1-470 has been redacted.

Attachment 2(d).1
In Response to Request 2(d)

**This entire attachment consisting of
2(d).1-1 through 2(d).1-6 has been
redacted.**

Attachment 2(e).1
In Response to Request 2(e)

**This entire attachment consisting of
2(e).1-1 through 2(e).1-2 has been
redacted.**

Attachment 2(f).1
In Response to Request 2(f)

**This entire attachment consisting of
2(f).1-1 through 2(f).1-18 has been
redacted.**

Attachment 2(g).1
In Response to Request 2(g)

**This entire attachment consisting of
2(g).1-1 through 2(g).1-2 has been
redacted.**

Attachment 2(h).1
In Response to Request 2(h)

Attachment 2(h).1 is an electronic document submitted on a CD-ROM.

Attachment 2(h).2
In Response to Request 2(h)

This entire attachment consisting of 2(h).2-1 through 2(h).2-20 has been redacted.

Attachment 2(j).1
In Response to Request 2(j)

This entire attachment consisting of 2(j).1-1 through 2(j).1-5937 has been redacted.

Attachment 2(j).2
In Response to Request 2(j)

This entire attachment consisting of 2(j).2-1 through 2(j).2-4607 has been redacted.

Attachment 2(j).3
In Response to Request 2(j)

This entire attachment consisting of 2(j).3-1 through 2(j).3-1236 has been redacted.

Attachment 3(i).1
In Response to Request 3(i)

**This entire attachment consisting of
3(i).1-1 through 3(i).1-52 has been
redacted.**

Attachment 3(i).2
In Response to Request 3(i)

**This entire attachment consisting of
3(i).2-1 through 3(i).2-11 has been
redacted.**

Attachment 6.1

In Response to Request 6



QUALCOMM



Supplemental Downlink Demo for FCC Booth slides

May 11 2011



6.1-1

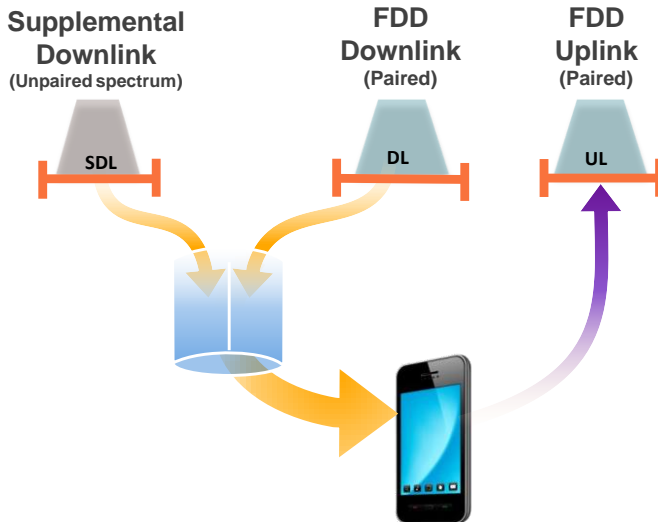
SDL

SDL

Supplemental Downlink Helps Ease Spectrum Crunch

- Uses unpaired spectrum for faster downloads & to support more users
- Addresses epicenter of spectrum crunch— more downloads than uploads
- Being standardized for LTE in LTE-Advanced. Demo uses HSPA+.

- QC unpaired Lower 700 MHz D and E spectrum would be bonded with AT&T paired spectrum on which AT&T has deployed LTE (not 700 MHz), if ATT-QC deal is approved.
- Demo uses 2 x 5 MHz of AWS-1 paired spectrum & 5 MHz of unpaired spectrum at 1.4 GHz.



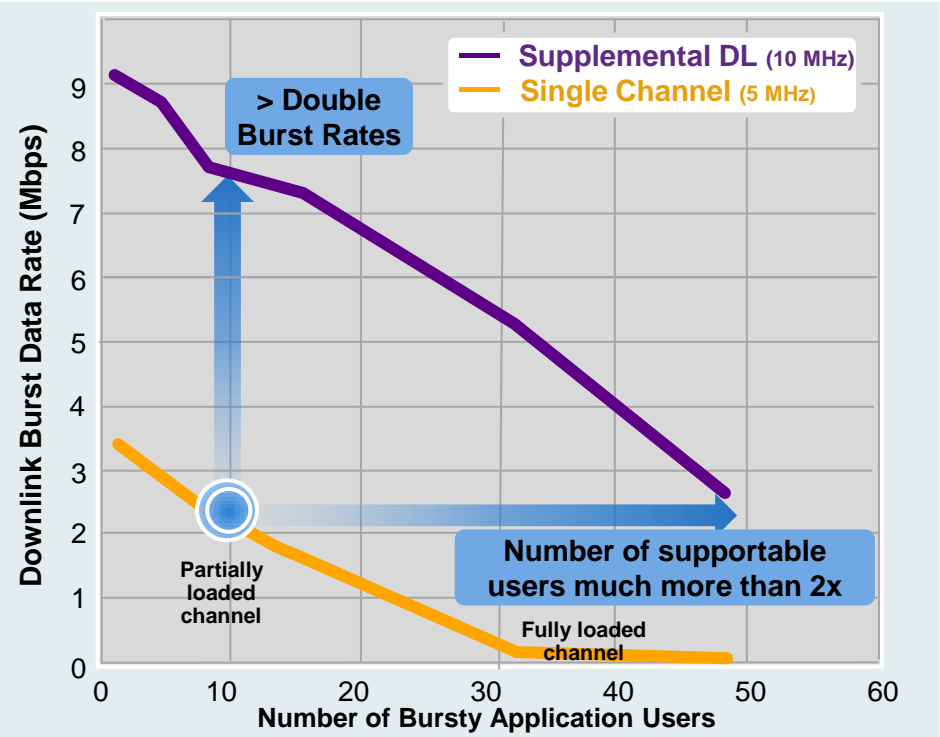
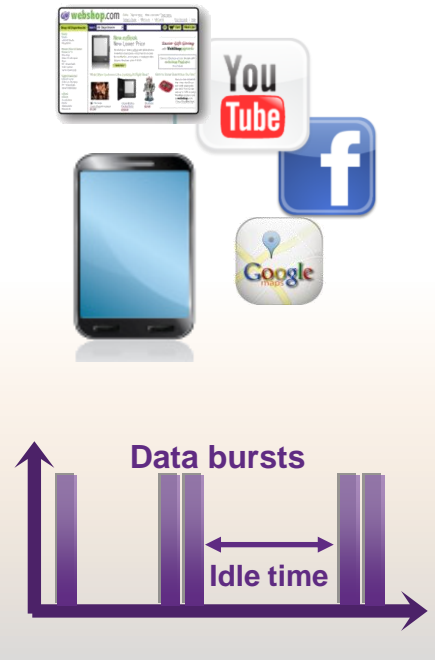
6.1-2

¹Aggregation across bands already supported in 3GPP R9, but each additional band combination has to be defined in 3GPP.

²L-Band in Europe: 1452 MHz to 1492 MHz.

Supplemental Downlink Supports Faster Downloads, More Users & Enhances the User Experience

Bursty Data Applications



6.1-3

Qualcomm simulations. 16 R99 users on anchor channel and varying data users on 5MHz single or on 10MHz SDL channel 1km ISD, PA3, Pilot Power = 10% Other Overhead Power = 20%. R99 user power consumption = 20%. Lower control overhead on the SDL carrier: 10%. The bursty nature means that a multicarrier can support more users at the same burst rate for partially loaded carriers. The gain depends on the load and can exceed 100% for fewer users (less loaded carrier) but less for many users (starting to resemble full buffer).

HSPA+ Supplemental Downlink Demo, With L-Band

AT&T Innovation Center
Washington, DC

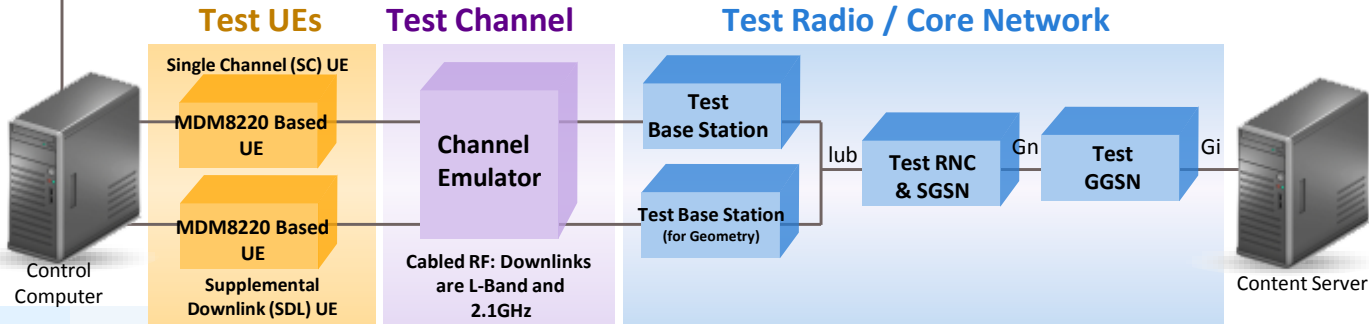


Display Computer



Real Time Display and
Control of System
Performance

Equipment Room, San Diego, US



Attachment 6.2

In Response to Request 6

This entire attachment consisting of 6.2-1 through 6.2-7 has been redacted.

Attachment 13.1

In Response to Request 13

Table 1
Carrier Aggregation Combinations for Multiple Band Scenarios (Inter-Band) in 3GPP Work Program (V5 6/1/11)

Current Work Items in 3GPP on LTE Carrier Aggregation for Multiple Bands (Inter-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ¹
1 + 5	FDD x MHz Inter-band Non-contiguous (2100 + 850) 20 MHz (Band 1) + 20 MHz (Band 5)	1920- 1980/2110- 2170 824-849/869- 894	No specific Region /Operator Scenario – (Generic Baseline)	Baseline CA work case for inter-band FDD	RP-091440 RAN #46 12/2009 RP-100661 RAN #48 06/2011
3 + 7 (EU)	FDD 40 MHz Inter-band Non-contiguous (GSM1800 + 2.6GHz) 20 MHz (Band 3) + 20 MHz (Band 7)	1710- 1785/1805- 1880 2500-	European Region European Operators (Orange,	Operator Requested WID	RP-100668 RAN #49 9/2010

¹ Work Item Descriptions can be found at: http://www.3gpp.org/ftp/Information/WI_Sheet/

Current Work Items in 3GPP on LTE Carrier Aggregation for Multiple Bands (Inter-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ¹
		2570/2620- 2690	Telefonica, Telia Sonera, Telecom Italia)		
4 + 13	FDD 40 MHz Inter-band Non-contiguous (AWS + US 700) 20 MHz (Band 4) + 20 MHz (Band 13)	1710- 1755/2110- 2155 777-787/746- 756	United States Verizon	Operator Requested WID	RP-101435 RAN #50 12/2010
4 + 17	FDD 40 MHz Inter-band Non-contiguous (AWS + US 700) 20 MHz (Band 4) + 20 MHz (Band 17)	1710- 1755/2110- 2155 704-716/734- 746	United States AT&T	Operator Requested WID	RP-101391 RAN #50 12/2010
20+7	FDD 30 MHz Inter-band Non-contiguous (Europe 800 + IMT extension)	791-821/832- 862	European Region European	Operator Requested WID	RP-110403 RAN #51

Current Work Items in 3GPP on LTE Carrier Aggregation for Multiple Bands (Inter-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ¹
	10 MHz (Band 20) + 20 MHz (Band 7)	2500- 2570/2620- 2690	Operators (Orange, Telefonica, Telia Sonera)		03/2011
5+12	FDD 20 MHz Inter-band Non-contiguous (850 + US 700) 10 MHz (Band 5) + 10 MHz (Band 12)	824-849/869- 894 698-716/728- 746	United States Cox Communications, Cellular South. US Cellular	Operator Requested WID	RP-110372 RAN #51 03/2011
4+12	FDD 20 MHz Inter-band Non-contiguous (AWS + US 700) 10 MHz (Band 4) + 10 MHz (Band 12)	1710- 1755/2110- 2155 698-716/728- 746	United States Cox Communications, Cellular South. US Cellular	Operator Requested WID	RP-110135 RAN #51 03/2011

Current Work Items in 3GPP on LTE Carrier Aggregation for Multiple Bands (Inter-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ¹
2+17	FDD xx MHz Inter-band Non-contiguous (PCS + US 700) xx MHz (Band 2) + xx MHz (Band 17)	1850- 1910/1930- 1990 704-716/734- 746	United States AT&T	Operator Requested WID	RP-110432 RAN #51 03/2011
4+5	FDD xx MHz Inter-band Non-contiguous (AWS + 850) xx MHz (Band 4) + xx MHz (Band 5)	1710- 1755/2110- 2155 824-849/869- 894	United States AT&T	Operator Requested WID	RP-110433 RAN #51 03/2011
5+17	FDD xx MHz Inter-band Non-contiguous (850 + US 700) xx MHz (Band 5) + xx MHz (Band 17)	824-849/869- 894 704-716/734- 746	United States AT&T	Operator Requested WID	RP-110434 RAN #51 03/2011

Current Work Items in 3GPP on LTE Carrier Aggregation for Multiple Bands (Inter-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ¹
Qualcomm Media Flo Spectrum (new 3GPP band) + 2	FDD xx MHz Inter-band Non-contiguous (PCS + Media Flo Spectrum) xx MHz (Band 2) + xx MHz (Media Flo Spectrum – as additional downlink) Note: 3GP Band number for Qualcomm Media Flo Spectrum not yet assigned)	1850- 1910/1930- 1990 Qualcomm Media Flo Spectrum (716-728)	United States AT&T	Operator Requested WID Note: 3GPP Band number for Qualcomm Media Flo Spectrum not yet assigned	RP-110435 RAN #51 03/2011

Table 2
Carrier Aggregation Combinations for Multiple Band Scenarios (Intra-Band) in 3GPP Work Program (V5 6/1/11)

Current & Proposed Work Items in 3GPP on LTE Carrier Aggregation for Single Band (Intra-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item ²
1	FDD 40 MHz Intra-band contiguous 2100 UL 20+20 MHz, DL 20+20 MHz	1920-1980/2110-2170	Global IMT Core Band Any operators licensed for IMT Core band	Baseline CA work case for intra-band FDD	RP-091440 RAN #46 12/2009 RP-100661 RAN #48 06/2011
40	TDD 40 MHz Intra-band contiguous 2.3 GHz UL/DL 40 MHz	2300-2400	Asia China Mobile Communications Co. (CMCC) & Chinese	Baseline CA work case for intra-band TDD	RP-091440 RAN #46 12/2009 RP-100661 RAN #48

² Work Item Descriptions can be found at: http://www.3gpp.org/ftp/Information/WI_Sheet/

Current & Proposed Work Items in 3GPP on LTE Carrier Aggregation for Single Band (Intra-Band) (As of 5/31/2011 – information subject to change)					
3GPP Band	"Identifier"	Frequencies (MHz)	Region or Country & Operator	Notes	Work Item²
			Operators		06/2011
38	TDD Intra-band contiguous 2.6 GHz (China)	2570 - 2620	China China Mobile Communications Co. (CMCC)	Operator Requested WID New Work Item Proposal - RAN #52 (31 May - 4 June 2011)	RP-110718 (proposed)
41	TDD Intra-band contiguous 2.6 GHz (Americas)	2496-2690	United States Clearwire, South America NII Holdings	Operator Requested WID New Work Item Proposal - RAN #52 (31 May- 4 June 2011)	RP-110673 (proposed)

References:

3GPP RAN TSG Plenary Reports:

RAN #46	01-04 December 2009	RP-100002	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_46/Report/
RAN #47	16 - 19 March 2010	RP-100648	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_47/Report/
RAN #48	01 – 04 June 2010	RP-100969	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_48/Report/
RAN #49	14 – 17 September 2010	RP-101373	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_49/Report/
RAN #50	07 -12 December 2010	RP-101363	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_50/Report/
RAN #51	15 -18 March 2011	RP-11xxxx (draft report)	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_51/Report/
RAN #52	31 May – 4 June 2011	RP-11xxxx (draft report)	http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_52/Report/

3GPP Technical Reports:

TR 36.807 v0.1.0 <http://www.3gpp.org/ftp/Specs/html-info/36807.htm>

Attachment 19(ii).1
In Response to Request 19.ii

This entire attachment consisting of 19(ii).1-1 through 19(ii).1-4 has been redacted.